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VOL. XX ST. LOUIS, JANUARY, 1934 No. 1

ORIGINAL ARTICLES

PRESIDENT'S ADDRESS

GREAT LAKES ASSOCIATION OF ORTHODONTISTS*

JAMES D. LOCKE, D.D.S., GRAND RAPIDS, MICH.

IT HAS become extremely difficult to deliver a president's address before an organization of this type without indulging, in a measure, in a repetition of thoughts that have been previously presented before like organizations throughout the country. There are, however, some few things which I should like to touch upon at this time.

The first, and one in which I know we are all interested, is the potential sphere of influence of our Great Lakes Society to men practicing our specialty in the contiguous territory designated by the name given to our organization.

The men who were instrumental just a few years ago in bringing together a few orthodontists, practicing in a territory adjacent to Detroit, with the thought in mind of nothing more than a study club, had no conception that this group was to be the nucleus of what is today a splendid going orthodontia society.

There is one essential for success in an organization such as ours, and that is a spirit of interest among its members, of that we have a full measure. I have never seen more wholehearted good-fellowship and interest exhibited than that which exists among the men in our group. We always have an enthusiastic attendance at our meetings.

We are fortunate in that a great percentage of our membership comprises younger men who are interested and who have the ability and will to carry on. We certainly are entirely free from cliques. With all of these desirable qualities, this organization is bound to grow and to be of unending usefulness to its members.

*Meeting held in Cleveland, Ohio, February 27, 1933.

While numerical strength is not entirely essential to success, nevertheless, it does furnish additional funds with which to provide meetings of the highest standards, which in turn makes these meetings of greater benefit to the entire membership. With this in mind, it should be the duty of each man in our Society to make an effort to secure a new member.

Sell the thought of what this organization is doing and what it will mean to your friends, and your effort will be reflected in the growth and usefulness of your Society. The character of this meeting and of past meetings must be a matter of considerable pride to our members.

The question arose this year as to the advisability of spending much money to furnish a program for our present meeting. Dr. Moore naturally was eager to provide a good program, and I felt it would not be good judgment to curtail at this time. We are still in the formative stage, and should we in any way fall down at this time, it might reflect itself on our growth and success for several years to come.

Conditions are such today that if men pick up a program and conjure in their minds some reason for not attending their meeting, they are quick to justify that reason.

I should like to inject at this time some few thoughts as to the position of our specialty in its relation to the economic conditions of the day.

It is not necessary, of course, to reiterate the tremendous shakedown that has taken place during the past three years.

During the period antedating the fall of 1929 we all went along blindly exulting in our success, demanding more and more for ourselves and families, and demanding more from our city, state, and federal governments, until we built up a credit structure that was stupendous and beyond the ability of the people to pay. We were overbuilt both mentally and industrially.

As long as the going was good these things bothered us but little, and we all became convinced that good times were to be a permanent institution, so far as we were individually concerned; but when the normal income dwindled in 1932 to less than 40 per cent of what it had been in 1929, it caused every one to sit up and take notice.

From sources, other than technocracy's laboratory, it is a proved fact that man power unit increased over 3 per cent, and consumptive capacity increased but 1⅓ per cent during the period from 1920 to 1929, with a steadily mounting unemployment situation.

Business was artificially stimulated and purchasing power maintained by credit-financing on a large scale, until the balloon became so inflated that it burst right in the public's face.

During this period we had built up a thought in our minds that orthodontia was no longer a luxury in the families with whom we came in contact, but was a fixed requirement. Consequently, in common with others, members of our profession built up an expensive overhead, which, in many instances, it appeared poor business to endeavor to maintain.

Office buildings were erected on a high cost basis, and leases were made on what is today an excessive cost in many practices.

Many substantial families in every community have suffered reverses from which they will not recover. The clientele of most orthodontic practices throughout the country has been equally hard hit. Many families who were accustomed to engage our services will be compelled to forego this work entirely. Many others will postpone treatment until the cases become so complicated that correction will be difficult. In all events, the orthodontist is going to earn his fee. There will not, at least, be the overflow that has been the case in many practices heretofore.

It is a well-known fact that many communities were well equipped to take care of the number of orthodontia cases that existed in their communities at the highest peak of prosperity. Now, with a lessoned number of potential cases in most communities, and with a lessened ability to pay on the part of those desirous of this service, what is to be the status of our position as professional men?

There have been two classes of patrons in almost every orthodontic practice. There is first the business man, banker, etc., who has derived at least a part of his income from investments. Then there is the man who has had a good income from personal service and who has no especial background of assets. So far as ready cash is concerned, they are, more or less, in the same boat today.

How are these cases to be handled from a fee standpoint. The man who has had a shrinkage in value in his assets will snap back into the picture when business begins to recover. The other chap will have an uphill climb. Salaries will be raised only when business shows a justifiable profit.

There are men in every community who, in the thought of personal security, will drastically reduce their fees all along the line.

If the present conditions continue indefinitely, it may become necessary for us to readjust ourselves accordingly. The history of this country, however, disproves this thought. Henry Ford says that he does not believe in history. Perhaps he is right. He is, however, at the present time, shaping his business activities based on this country's history of experience.

No doubt, many thoughts of like nature have been working in the minds of many of the men present, and I should be glad to hear a frank discussion of our situation at some time during this gathering.

I want to take this opportunity to thank the men who are responsible for this meeting. I want especially to thank Dr. George Moore for his untiring energy in securing the essayists for our program and for other assistance he has given.

I want to thank Dr. Howarth for securing and arranging the program which is to be presented by the group in Cleveland, and Dr. Vosmik for the splendid arrangements which he has completed for our entertainment.

Dr. Bruce Foster has provided an interesting program of clinics against what, at first, did not present an encouraging outlook.

I want to thank all of the committees for their willing cooperation and their efforts in making this fine meeting.

THE UTILIZATION OF BIOLOGIC PRINCIPLES IN THE STUDY AND TREATMENT OF MALOCCLUSION OF THE TEETH*†

A. LeRoy Johnson, D.M.D., New York, N. Y.

THERE are today few who will question the statement that there are definite limitations to conventional methods of treatment. I think it is agreed for the most part that an analysis of the basic concepts of orthodontia is the first step in the definition of these limitations as it is in finding new paths that lend to more effective service. Our history reflects the principal weakness in modern dental education, i.e., lack of training in the biologic sciences. In our attempt to fulfill our professions we have plunged from one panacea to another; from the constancy of the position of the first maxillary molar; to the Grunberg symmetroscope; to dental engineering; to the Kew ridge; to Simon's orbital plane; to judicial extraction, and now we are groping our way through a maze of statistics. Fashions have come and gone as fashions do. Each one has made its contribution, and yet each one has failed to fulfill its promise. So now we are keenly conscious of our limitations.

We have passed through the empirical stages of our development and are now entering the morphologic period with the experimental not far distant. Slowly but surely the idea has been coming home to us that in malocclusion of the teeth we face a very complex problem, in fact, far more so than it was formerly thought to be. Experience has broadened our horizon. We now see in occlusal phenomena an expression of the metabolic activities of the organism as a whole. Diagnosis is an individual problem. Instead of basing our decision of normality on a comparison of occlusal conditions of one person with another, we are coming to realize that in the last analysis diagnosis is a question of ascertaining to what degree the peculiar relations of a given case is a possible factor of maladjustment in the life activities of the whole individual. It is a problem that involves the most searching study of biologic phenomena and, may I add, of social standards as well. The general acknowledgment of these truths is responsible for the changing tenor of our literature. It will eventually modify our methods of treatment.

I shall review certain biologic principles that stand out particularly in everyday practice, and shall attempt to show how they are utilized in treatment.

At the outset may I refer to that much mooted question of the meaning of "normal." Normal occlusion, so-called, has been accepted so long as the basic principle of treatment, and the misconception of its true significance is responsible for so many of the woes of present-day practice, that I am really under no obligation to offer an apology for bringing it up. Our interpretation of what normal means enters into everything we do. When we are dealing with basic principles, a brief discussion of this question is most certainly in

*An introduction to an illustrated lecture on the design and manipulation of appliances in treatment.

†Read before the Great Lakes Society of Orthodontists, Feb. 27, 1933.

order. As a matter of fact, it is the most effective way to introduce the point of view that characterizes this entire discussion.

The word "normal" is used very carelessly. Like the word "good" or "just," "normal" is used emotionally as often as it is objectively. But in all medical science there must be some general standard of measurement, and common usage refers to this standard as "normal."

Orthodontics seems to have been the one place in all medical science where "normal" has been very definitely defined. As we shall see, this was done with little regard to fact. Back in the days of Angle we knew what "normal" was without doubt. You remember we defined "normal occlusion" without the slightest hesitation; it was our doctrine; immutable; it was no longer a subject for verification. So completely was it our guiding motive that to question it was to be guilty of lowering the colors. Fortunately for the children of the future this attitude is being modified. Fact is making itself felt.

The natural variation of all organic structures and functional processes precludes in the practice of any phase of medicine or dentistry the use of a fixed standard of measurement in the recognition of abnormalities. One does not have to go far in morphology to find it so complicated and the range of variation of all characters so great that simple formulas are out of the question. The further one goes the less one is likely to try to define "normal" as within definite morphologic limits. Even the anthropologist who is concerned, not with individuals, but with races and groups, not with men, but with the origin and destiny of man; even he hesitates to designate anything as abnormal which is not positively dysfunctioning. Hooten of Harvard (1927) says the word "normal" has been dropped by most anthropologists because of their inability to determine where normal variations end and the abnormal begins. Obviously our former assurance was hardly justified.

The ultimate decision in every case must be rendered on the basis of its individual peculiarity. The internal temperature of the human body, one of its most constant characters, averages 97.3 degrees F. at 4 A.M. and 99.1 degrees F. at 4 P.M. (Cannon—*Wisdom of the Body.*) Although thermometer makers stamp 98.6 degrees F. as normal, medical scientists know that normal temperature may be different in different people and different at different times of day.

Haldane in *Philosophical Basis of Biology* says: "The normal in biology is an individual normal. Accurate investigation in human physiology has forced this fact upon me again and again. In different individuals of the same species the normal activities of life are appreciably different and what is normal for one is not normal for another."

It is not necessary to quote other authorities or to give further illustrations. The idea is clear and is being accepted in orthodontics. There is no standardized normal that applies equally well to all people. In orthodontics we cannot make the dentures of all people conform to one definite pattern, nor do we expect to realize in all cases an invariable scheme of relations for each and every tooth.

Today we recognize the entire dental mechanism in its relation to the whole individual as our object of study. Our interests are not so exclusively con-

fined to the occlusal relations of the teeth as formerly. From habit in diagnosis we still note occlusal relations first. Perhaps we should. Be that as it may, racial standards and collective norms are not the inflexible guides they once were. The point is that in diagnosis other things are being given equal importance to occlusal phenomena.

Our purpose then, as we see it, is not solely to endeavor to create an ideal occlusion, but to aid in the structural orientation and functional processes of the human jaws and teeth that the whole dental mechanism will constitute an assemblage of parts best suited to the well-being of the whole individual. We think of normal, first, as a condition of structural relations that is most effective in establishing and maintaining the physiologic organization of the entire dental mechanism, and, second, as occlusal relations within the limits of type. That the second is subordinate to the first is the point of emphasis. This is not academic jargon. These are not abstract ideas. You may call it theory if you wish, but do not dismiss it as impracticable. There is absolutely no justification for doing so. On the contrary, it is the very essence of everyday practice.

In the absence of fixed standards of measurement, what are we to base our estimate of normality upon? If we are not to compare the dental mechanism with an ideal of structural conformation, how are we to know whether a case is normal or abnormal? How are we to know when treatment is indicated? In my opinion our judgment must be founded mainly on a knowledge of developmental phenomena and physiologic interactions. In a general way we must study the individual case on a background made of questions such as these:

1. What rôle do the teeth play in the adjustments and survival of the human organism?

2. Is the dental mechanism at this stage of evolution in a sense retrogressive?

3. Are certain peculiar structural formations of genetic origin, and if so to what extent can they be modified?

4. Do all cases possess equal potentialities of development?

5. The typical is our guide in the study of occlusion. To what extent shall we try to produce it in the individual?

There are of course other questions I might formulate, but I believe this expresses the point of view. However confusing and perplexing this attitude may be, the understanding of what the normal is as it relates to the individual as a basis for treatment rests solidly upon it. It is imperative that we think our problem through to the philosophic base on which it stands. Even though we fail; even though we fall far short, each effort will broaden our understanding. It will lead us away from the superficial concepts that once prevailed.

It has been demonstrated over and over again that for the human being of today an ideal of mechanical perfection in occlusion is not normal for all. It is not found in human beings, so, obviously, it cannot be maintained. As a standard of practice it is a myth. Reality is far from even so glorious a

fiction. We are concerned with reality. Our purpose is to bring harmony out of disharmony, to adjust in consistent and suitable physiologic relations the teeth to their supporting structures. In some cases we accomplish our end by restoring typical occlusion; in others by extraction, and in all cases by recognizing our dependence upon inherent functional processes, and the inevitable limitations imposed by the integrating factors of the organism as a whole. This has been referred to as the biologic point of view in orthodontic practice.

Inasmuch as the point of view I am trying to express has been given a name, it follows that there are other points of view in orthodontic circles. Of course there are. We cannot all think alike. Until we know more, there are sure to be different interpretations of conditions. We really know very little, and we are all fallible when facing the immense difficulties presented by the investigation of natural phenomena. Yet however different our intellectual processes may be, it is agreed that we must reason from observed fact. Progress and good sense demand the impersonal discussion of the interpretation of evidence, however unconventional these interpretations may be.

Experience in orthodontic practice has led me to believe that in our former zeal for an ideal we not uncommonly misinterpreted facts. Time will not permit many illustrations, a few will answer my purpose. The form of the trabecular structure of long bones of man and other vertebrates bears unmistakably a functional relation to the compression and tension effects of the mechanical load. This relation is evident in a cross-section of the head of the femur. This condition has often been used by orthodontists to illustrate the reaction of osseous tissue to physical force. But the idea was carried too far, for the arrangement of the spongy tissue in the fetus is already substantially the same as it is in the adult bone. Furthermore, it is agreed among scientists that the normal formation of spongy tissue depends equally upon its fitting harmoniously into the form of the bone as a whole and upon functional adaptation. There is then a very definite limit to what we can safely do to the alveolar tissue supporting the teeth. It has been claimed, you may recall, that even that innate force called growth as expressed in the supporting tissues of the teeth is stimulated, directed, and controlled by occlusal phenomena. In fact all developmental processes of the face were once believed to be subservient to the forces of occlusion. Such an attitude is extreme and is not borne out by facts. Other instances might be cited where evidence has been compromised. Now this digression was made to show how naturally a critical analysis of what normal means leads to the very heart of our problem. It is one of the most effective ways to clear away the débris that clings to orthodontic thought. There is nothing we can do to order our thinking that is more helpful than to attempt to express what we mean by the normal dental mechanism. The further one goes in this attempt the less dogmatic one becomes.

The statement was made above that in diagnosis we are concerned with both biologic and social phenomena. As a matter of fact the two groups are of course not distinct; yet for our present purpose there is an advantage in treating them separately.

By social factor in diagnosis I mean the rôle of facial expression in personality adjustments. Without doubt the physiologic integrity of tissues and functions is always of major importance. Yet it is true that there are cases where treatment is thought to be merely for the purpose of improving facial expression. I say merely, not because such treatment is not important, but because in the light of present knowledge it is often the only reason for treatment. Nevertheless, the teeth are so important a factor in the expression of personality that there can be no question of their appearance being a function of health.

Although in social adjustments structural defects are usually of lesser importance than functional disorders, they are nevertheless factors which should not be overlooked. A clubfoot or a sixth finger certainly determines health values in the larger sense, as they militate against living fully and in most useful service. Thus a condition of occlusion which by any known means cannot be designated as pathologic may be so atypical in relation to other facial features as to produce emotional reactions that are decidedly disadvantageous. So large a part of our time is devoted to handling cases of this sort that it is well to remind ourselves that they are not always so simple as they might be.

Health is a state of being that results from the interaction of all the elements bound together in life. It depends upon the combined activities growing out of the physical, mental, and emotional potentials of an individual. The evolution of health and happiness is a continuous expression of reactions conditioned by morphologic, physiologic, and psychologic responses. It is possible for orthodontia to make a great contribution to human happiness if we proceed cautiously.

From the standpoint of looks alone how are we to know when treatment is indicated? Can the question be answered on the basis of feeling, i.e., of "art requirements"? (Angle.) Are all cases so perfectly responsive to our treatment that we can plunge in anywhere, confident of success?

In the past this question was answered by a belief founded not on fact, but in an ideal. It was assumed that all parts of the individual organism developed in harmony unless interfered with by some extraneous force. And from this came the assurance that the perfect denture was the natural, the innate, the inborn manifestation realized in all cases when environmental influences were what they should be. So perfection was the rule. Any departure from perfection was abnormal. Furthermore, it was assumed that all cases were equally responsive to treatment. In short, we had merely to look at occlusion, and comparing it with our ideal of perfection we knew in just what degree the denture and supporting structures were out of harmony with the rest of the face.

Taking into consideration the ultimate results of treatment of many cases, and, also, the time and expense involved, taking everything into consideration, we must conclude that too large a percentage of our work has been of doubtful value to continue to rest our prognosis on these ideal concepts. The ability to determine "art requirements" is not enough. On that basis our vision is not sufficiently penetrating. But more than this, regardless of our past limitations, there is today adequate evidence to believe that certain ir-

regularities and malocclusions, even of this class we are now referring to, sometimes express such basic forces in the life activities of an individual that attempts to reproduce typical occlusion will create a condition as much out of harmony with other parts as the original condition itself. It was a decided step forward when we ceased to think of occlusion as the sole and only factor in determining the normality of the human dental mechanism.

But we must watch our step all the way. At present there seems to be a tendency to overemphasize the value of statistical data in diagnosis. Having been engaged for the past year in no inconsiderable amount of work involving statistical methods, I feel perfectly free to speak out, as the criticism, if it is to be so interpreted, will fall on no one more directly than myself. I shall not attempt here an analysis of the statistical method as it applies to medical science. Others can do this much better than I. There are, however, certain well-recognized truths relative to the use of statistics that we must not overlook in our zeal for a criterion of structural form and harmony of parts.

It should be remembered that with statistics we get a conjecture, an inference of greater or less probability about a given case. Nothing more. Hence we as practitioners derive no other benefit from them than a general indication of what may be a characteristic condition for a certain stage of development. Statistics cannot tell us the degree in which one part of an individual is out of harmony with other parts. Its goal is the estimation of probability. It is always group study. The "law of large numbers" teaches us very little about the particular case. An eminent mathematician says of statistics: "They are always true in general and false in particular." It is the particular with which we are concerned. Comparing the facial dimensions of one person with statistical norms can be no more than suggestive. It gives us a background against which we may see the individual more clearly. But to rest our entire judgment of harmony or disharmony, of normality or abnormality on such a comparison is folly.

Therefore, in our study of the dental mechanism we practitioners no longer accept ideal occlusion as the unfailing measure of the development of the supporting tissues. Statistical methods have definite limitations when applied to the individual. We know we are not justified in trying to devise any one standard, scheme, or method that will indicate degrees of disharmony in all cases. Even the most simple case, the one for "looks" only, is far too complex for any such procedure. It has been said that when the schematic concept of occlusion as the normal for each individual was questioned the high standards of orthodontics were threatened. Such an attitude is entirely out of sympathy with modern scientific thought. Our field is within the realm of medical science. We base our activities on what is known in medical science and conform to the accepted methods of medical science in the study of the unknown.

Although in diagnosis we should not place too much reliance in statistical data, they do have a very definite place in orthodontics as they have in all fields where causes are unknown. Statistical studies may point the direction for the investigation of causal factors. Of course in order to qualify in this particular the material studied must be carefully selected and individual histories known as far as possible. In fact the results of such studies are valu-

able so far as the histories are known. Mere mass studies are of very little value.

Etiology is the blank page in orthodontics. Even allowing for the work that has been done revealing the way certain anomalies evolve, we feel at this time as never before the handicap we labor under in our ignorance of causal factors. This feeling is the hopeful sign of the times. We do not agree with Simonds that therapeutics need have no relation to etiology. It is true that our past gives little evidence of this relationship; nevertheless, today, it is clear to all students of orthodontics that unless such a relationship can be established we shall not go far. In fact, the goal of prevention cannot even be hoped for; and without at least direction toward this goal, we indeed present a very sorry spectacle in medical science.

Whether we are treating the so-called "simple case for looks only" or the most complicated form of malocclusion, the functional, dynamic processes of cellular metabolism are our primary concern. It must be remembered that "each part of a living organism depends from moment to moment on its active relations with neighboring parts and with the surrounding environment; that all phenomena of the living body are in such reciprocal harmony one with another that it seems impossible to separate any part without at once disturbing the whole organism." (Claud Bernard.) The living organism is not a congregation of detachable units. Hence, as practitioners, we are compelled to study the dental mechanism in its relation to the rest of the body rather than on the basis of its relation to similar structures of other people. This means that our future, as for all medical science, lies in the utilization of the experimental method. Morphologic generalizations of themselves do not carry us near enough to certainty. We should not reject statistical studies. The point is to recognize their true value. Emphatically we must condemn the spirit of not trying to get beyond them and believing that in statistics we have the sole foundation of treatment. The experimental method alone can lead to certainty and that we must seek or etiology will continue to be a word only. Claud Bernard says: "When we see two phenomena in physiology or medicine going together or following one another in constant order, we think we may conclude that the first is the cause of the second. This would be a false judgment in very many cases; statistical tables of presence or of absence never establish experimental demonstrations. (They merely suggest.) In complex sciences like medicine, we must at the same time make use of comparative experiment and counter proof."

Our literature contains little knowledge of the etiology of malocclusion of the human being derived from animal experimentation, but there is very good reason to believe that it will soon be available. It is with confidence that I predict that today we are clinically observing conditions that will some day be elucidated by experimental analysis.

For several years Dr. Howard has been calling our attention to certain endocrine disturbances unquestionably associated with malocclusion. The impression has gone abroad that the cases he has shown are exceptions—freak cases. Some of them are, but that does not detract one iota from their value to us. They exhibit very conclusively the fact of a relation between endocrine

imbalance and malocclusion. Dr. Howard has demonstrated this over and over again. Now add to this the fact, accepted among scientists, that endocrine imbalance may begin at any time of life, that it often affects localized areas only, that there are degrees of acromegaly and achondrodystrophy, and that, as the base of the human skull and mandible are among the last of the growth centers to become inactive, they are especially susceptible to and expressive of developmental disturbances during its later stages; taking all these things into consideration we must not fail to give Dr. Howard the credit for having introduced a vital question in the study of etiology.

With the slides I shall show you experimental evidence bearing on this subject. A description of the work has been given also elsewhere, although the illustrations have never been published in connection with our problem.

In concluding this introductory statement may I say that etiology is the foundation stone of orthodontic practice inasmuch as it indicates the essential peculiarity of individual cases. Experience has taught us that the classification of morphologic characters is not enough. Two cases exhibiting almost identical occlusal relations often respond to treatment quite differently. Case reports are on record to this effect. (Cole.) So scheme against it as we may, observations of occlusion and facial measurements alone do not give us sufficient insight into the idiosyncrasies of cases to permit us to treat them intelligently. We may study facial disharmonies with the aid of statistics, but when it comes to the decision of treatment, we must utilize all means available to get at the etiologic factors peculiar to the individual in question. We must look upon a case not as an object but as a history and a history in the making. Developmental processes are ever active, and our knowledge of these processes as they are expressed in each patient determines what we shall or shall not do.

THE MUSCLES OF MASTICATION. THEIR RELATION TO PROBLEMS IN ORTHODONTIC TREATMENT*†

HARRY H. SHAPIRO, D.M.D., NEW YORK, N. Y.

THE authors of textbooks on orthodontia, Angle,[1] Dewey,[3] McCoy,[5] refer to the musculature of the face and jaws as contributing agents in malocclusion of the teeth, and point out the relation of the facial and masticating muscles to the problem of retention.

A considerable number of contributions have also been added to the literature of orthodontia indicating the necessity for muscle training; the work of Rogers[7] has been extensive in this field, and various forms of muscle exercises and devices have been developed for the purpose of stimulating tone and function in muscle fiber.

It is because of this relatively recent interest in the use of the facial musculature, which seems to be developing from theory to orthodontic therapy in the offices of many practitioners, that it would appear to be of advantage to review and if possible to amplify the knowledge of the anatomy of these muscles so that the actual functioning of the musculature be more clearly visualized during orthodontic interference.

We are aware that when inducing growth in a lateral, anteroposterior, or vertical direction of the alveolar bone of maxilla or mandible, or when instituting movement of malposed teeth in the arches of the jaws, the problem must be met, at least in the state of our present knowledge, by the use of mechanical appliances, skillfully constructed, adjusted, and controlled.

In attempting to establish, however, the relationship of one jaw to the other in orthodontic procedures, it becomes necessary to bring into play the musculature which controls the movements of the mandible; and of these, as we know, the more important are the chief muscles of mastication, the masseter, the temporalis, the external and internal pterygoids. These muscles are to be the subject of this paper.

Gross human anatomy is a subject with which most of us, as practicing orthodontists or dentists, have had no intimate contact since freshman days in the dental school. I mean by that, the actual dissection and close study of the injected cadaver. It has appealed to me, therefore, as a practical and useful educational procedure, to amplify the knowledge of the masticating musculature gained from the dissected cadaver, by making use of a dynamic rather than a static demonstration of the functionings of these muscles.

I have therefore dissected out the muscles of mastication in an uninjected specimen, and through the facilities of the Department of Anatomy at

*Read before the Tufts Dental Alumni Association at Tufts College, Boston, Mass., March 8, 1933.

†Department of Anatomy, College of Physicians and Surgeons, Columbia University, New York.

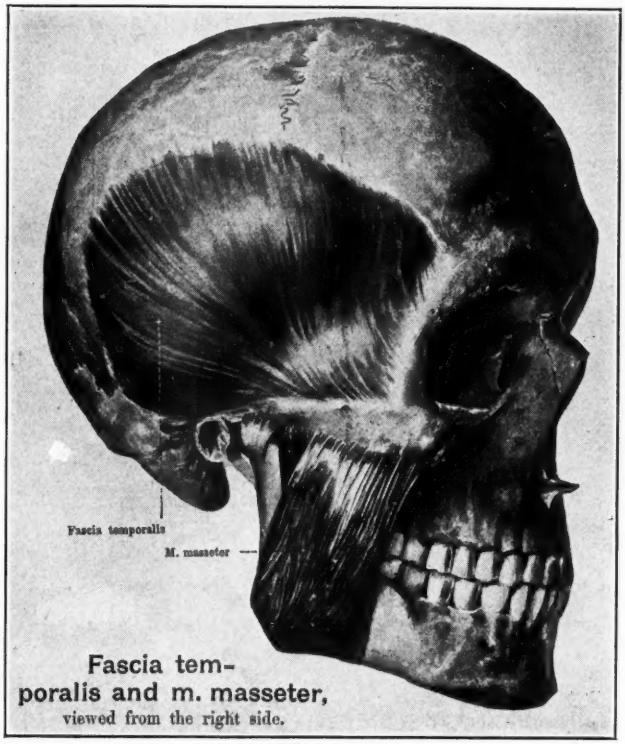


Fig. 1.

Figs. 1-4.—(From Spalteholtz, *Hand Atlas of Human Anatomy.*)

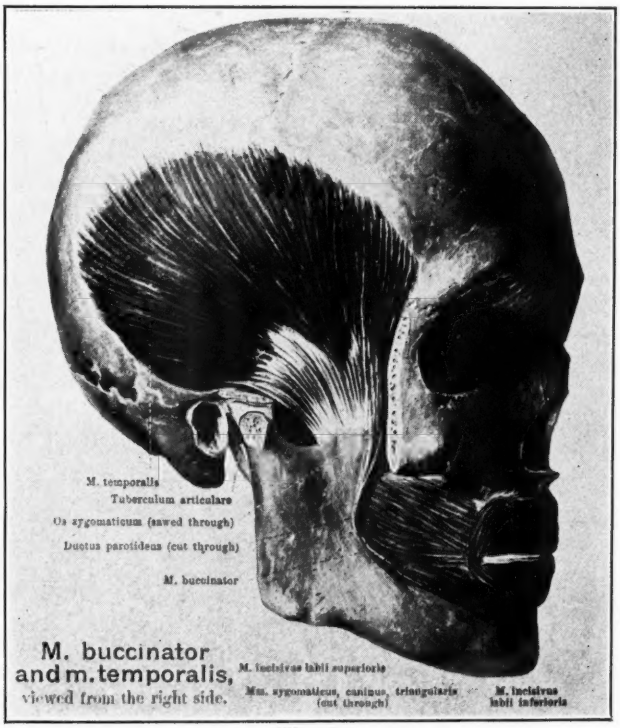
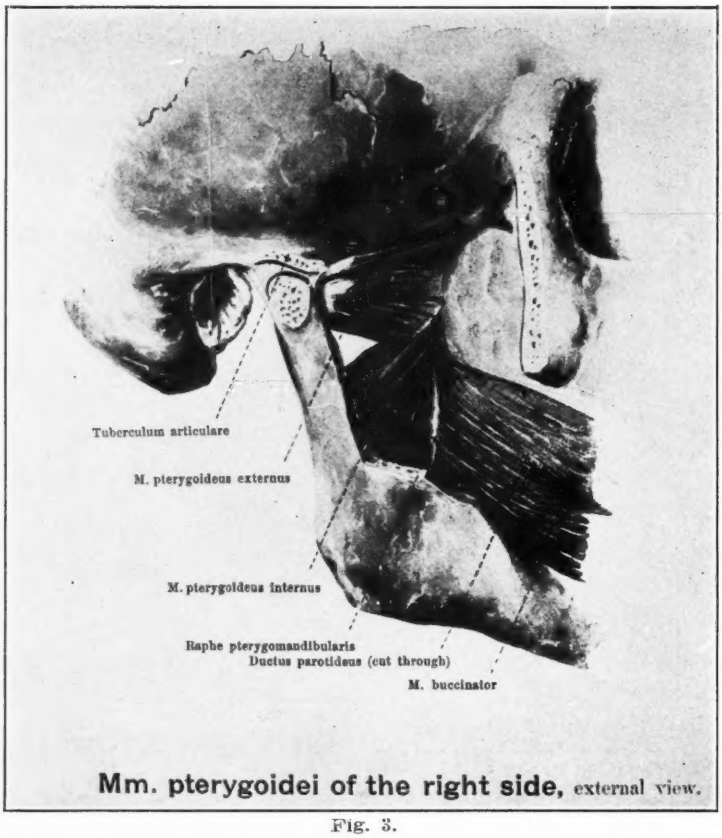
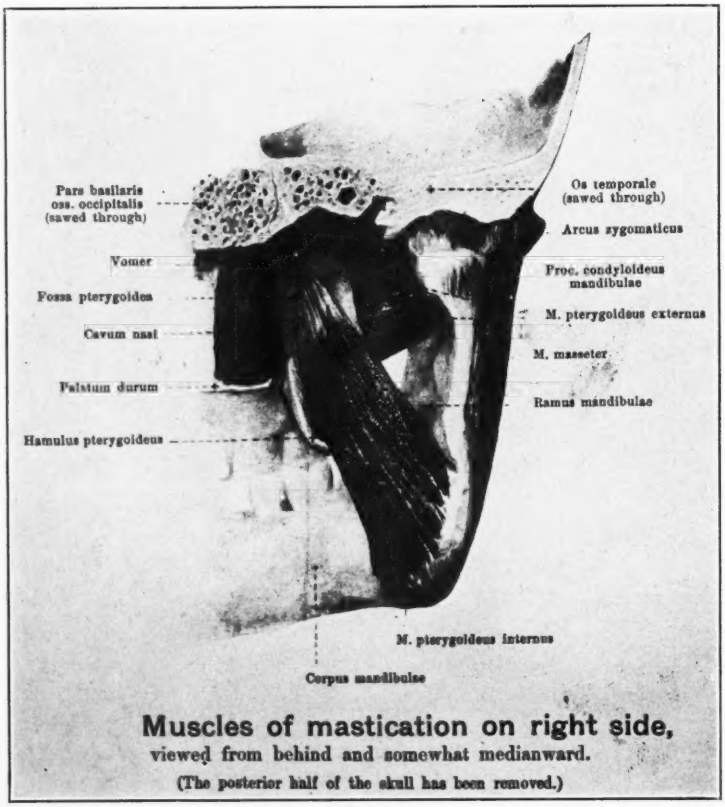


Fig. 2.



Mm. pterygoidei of the right side, external view.

Fig. 3.



Muscles of mastication on right side,
viewed from behind and somewhat medianward.
(The posterior half of the skull has been removed.)

Fig. 4.

Columbia University have had motion pictures made of these exposed muscles demonstrating their action during the various movements of the mandible.

I should like to review in condensed form, the origin insertions and actions of these muscles of mastication, and refer to some familiar types of malocclusions of the teeth and jaws which involve their functional anatomy.

I shall begin with the most superficial of the chief muscles of mastication, the masseter (Fig. 1). It has two places of origin, superficial and deep. The superficial portion is attached to the anterior two-thirds of the lower border of the zygoma. The deep portion is attached to the deep surface of the entire length of the zygomatic arch. The fibers of the superficial portion are directed downward and backward. The fibers of the deep portion pass directly downward and forward. The superficial fibers are inserted into the upper half of the ramus and the lateral surface of the coronoid process.

The action of the masseter is to raise the mandible. The superficial fibers tend to draw the mandible forward. This is a muscle whose fibers are adjusted almost at right angles to their points of attachment and make for powerful and direct action. In cases of distal relationship of the mandible to the skull, it seems quite evident that the jaws should be placed in a position of mechanical advantage as early in the treatment as possible, so that the assistance of these powerful fibers may be used from the beginning to cope with and overcome the faulty use of this muscle.

The temporalis (Fig. 2) has its origin in the whole area of the temporal fossa. From a fan-shaped attachment to the fossa and deep fascia which covers it, its fibers converge medially to the zygomatic arch, and insert by means of a strong tendon into both borders of the coronoid process of the mandible, all of its inner surface, and to the crest and border of its outer surface.

The action of the temporalis like that of the masseter, is to raise the mandible, but the more posterior fibers serve to retract the jaw when the mandible has been drawn forward.

In beginning treatment for mesial relationship of the mandible to the skull, the retractive force of these posterior fibers of the temporalis muscle should be employed very early in the treatment. It is a constant source of interest to observe the great amount of distal movement which the patient may procure at the very first suggestion to try to draw the mandible backward. (Fig. 3.) I am convinced that in Class III cases, the period of treatment is shortened, the mechanical procedures simplified, and the prognosis more favorable, when the retractive force of the fibers of the temporalis is used during treatment.

The external pterygoid (Fig. 4) has two points of origin deep to the temporalis, a superior head and an inferior head. The superior head is attached to the infratemporal head of the great wing of the sphenoid bone. The inferior head is attached to the outer surface of the lateral pterygoid place. The two heads pass backward and outward and unite to be inserted into the articular disc and capsule of the temporomandibular articulation, and the neck of the condyle.

The action of the external pterygoid is to draw the articular disc and condyle forward so that the mandible is protruded and the mandibular incisor teeth placed in an anterior relationship with the maxillary incisors. It also assists in opening the mouth, for anterior traction applied to the head of the condyle results in a downward movement through the glenoid fossa.

The internal pterygoid (Fig. 5) arises from the walls and floor of the pterygoid fossa. A smaller portion, lateral ward of the external pterygoid is attached to the tuberosity of the maxilla. Its fibers move downward, backward, and laterally to be inserted into the inner surface of the angle and ramus as high as the mandibular foramen.

Fig. 5.

Fig. 6.

The action of the internal pterygoid is to raise the mandible. It has as powerful an action in this respect as that of the masseter. It also assists the external pterygoid in the protrusion of the mandible and in the production of its lateral movements. The protrusion of the jaw is brought about by the combined action of all four pterygoids (Fig. 6), and the side-to-side motion is produced by the alternate action of the right and left pterygoids.

(Motion pictures of the functionings of these muscles of mastication were shown.)

I would especially call to your attention the extent of movement of the head of the condyle in the temporomandibular articulation and the great elasticity of the articular capsule in this uninjected dissection.

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THE CRISIS IN ORTHODONTIA*†

ALBIN OPPENHEIM, VIENNA, AUSTRIA

(Continued from page 1201, December, 1933)

The problem of the fulcrum of a tipping tooth, and the problem of continuity or intermittency of tooth movement, and also that of the formation of osteoid tissue, is closely connected with the present discussion. Therefore, they shall be considered in more detail.

First of all let us recapitulate my findings. In Fig. 1, we see the general view of the control tooth. Those tissue changes which are characteristic of labial movement can easily be demonstrated by a comparison of this figure with Fig. 2. In the control tooth (Fig. 1), the bone lamellae are arranged parallel with the long axis of the tooth. After forty days we find this structure entirely changed (Fig. 2). The tooth had been ligated to the expansion arch, and the adjustments were made in five-day intervals. The illustrations, therefore, show the result of an adjustment repeated seven times, and they picture the tissues in an active state of transformation.

On the labial side (side of pressure) there are newly formed bone trabeculae arranged in the direction of the force applied, extending from the alveolar margin apically beyond the middle of the root. These trabeculae are covered on the side facing the tooth with osteoclasts, which, under the influence of renewed pressure, produce again resorption of the newly formed trabeculae (Fig. 6 shows a higher magnification of area *A* from Fig. 2, and Fig. 7 shows a higher magnification of area *A* from Fig. 6). *Despite the often repeated pressure against the osteoid tissue, the cementum has remained almost completely intact.* On the opposite side of the same bone trabeculae, there can be seen an active formation of new bone (*oph*). In the interval between the different adjustments, the apposition of bone exceeds the resorption. From the middle of the root where the osteoclasts are visible in great numbers (Fig. 6 and Fig. 3, *OK*) up *to the apex* of the tooth, we can notice the presence of osteoclasts in gradually diminishing number. The periodontal space *all the way up to the apex* is thinner than that on the lingual side. If a tipping of the apex had taken place, then we should find on the labial side of the apex (side of tension), a broadened periodontal space, and on the lingual side of the apex (side of pressure), a thinned periodontal space together with signs of resorption. That this is not the case is clearly seen from Fig. 15, a specimen stained according to Mallory.

As far as the cementum is concerned, we notice that, despite an application of force repeated seven times, only one single, slight resorption has occurred

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†Translated from *Zeitschrift für Stomatologie*, Nos. 7 and 8, 1933, published by Urban and Schwarzenberg, Vienna and Berlin, from whom the electrotypes were obtained.

due to pressure against the osteoid tissue, which, as some authors claim, is so dangerous to the cementum (Fig. 6 at *x*).

On the lingual side (the side of tension in labial movement), we can study the formation of bone trabeculae in the direction of the tension, starting at the alveolar margin, and *continuing to the apex* in decreasing frequency (Figs. 2 and 3). In some of these newly formed trabeculae, we notice the overproduction of osteoid tissue, which leads to an abnormal thinning of the periodontal space (Fig. 2 at *x* and *y*, and Fig. 3 at *x*). *This constitutes a preventive measure of nature against loosening and sensitiveness of the tooth.*

In Fig. 4, which represents a higher magnification of area *x* of Fig. 2, there is illustrated the beginning union of osteoid tissue from two neighboring trabecu-

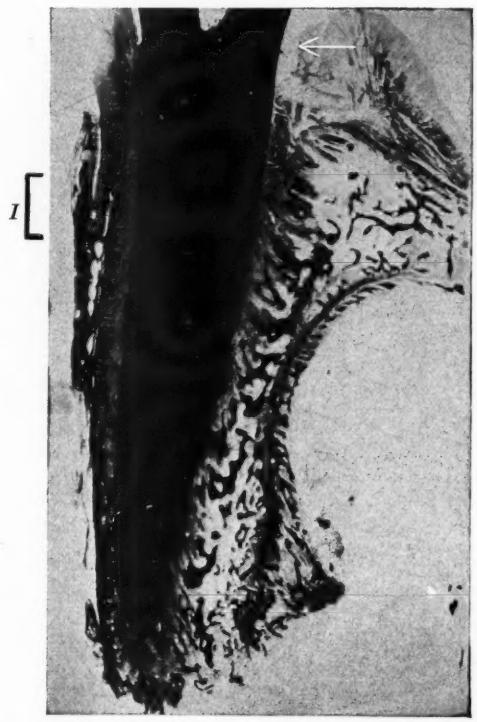

Fig. 15.—Same slide as Fig. 2 stained according to Mallory, for a distinct staining of bone and connective tissue; the same description as for Fig. 2; the direction of movement is indicated by the arrow; notice the unchanged position of the apex.

lae. It will be shown clearly in the retention pictures that this process is taking place on the whole lingual side (tension), thereby providing a continuous new alveolar wall closely adapted to the tooth.

At the same time there occurs on the other side (as was shown years ago), the resorption through numerous osteoclasts of such bone as has become superfluous.[2]

The formation of new bone trabeculae up to the apex and the absence of pressure areas in this region prove that this region is at rest. The center of rotation (fulcrum) lies at the apex.

If we examine Fig. 16 (a high magnification of area *1* from Fig. 15), then we can see on this (labial) side of pressure another phenomenon which must

be regarded as nature's endeavor to make the tooth firm and painless in these intervals between adjustments; *because after all firmness and painlessness are the only clinical criteria of properly adjusted forces.*

On the side of pressure, the transformation of the bone takes place through resorption and apposition. The periodontal fibers have lost their anchorage in the bone, due to the activity of the osteoclasts. When this process has progressed sufficiently, and when a large area of the alveolar wall has become involved, the tooth becomes sensitive, because, due to the loss of suspending periodontal fibers, it is pressed against its alveolar wall by every masticatory movement.

Those periodontal fibers which have been newly formed during the treatment intervals are found to be orientated (like the bone) in the direction of the

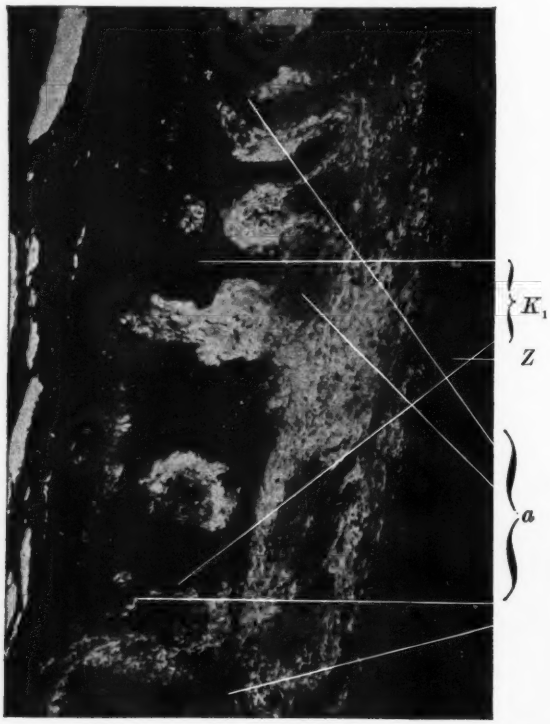

Fig. 16.—High magnification (80 times) of area *I* of Fig. 15; the periodontal fibers are, under the influence of the pressure, arranged (like the bone trabeculae) nearly perpendicular to the long axis of the tooth; they can be seen to insert themselves at *a* into the newly formed bone trabeculae (K_1); *Z*, tooth.

force (function), and they are anchored within the newly formed osteoid (Fig. 16 at *a*). If the intervals between the adjustments are of longer duration, i.e., if the stimulation of the normal function exceeds the stimulation through the orthodontic force, then a *functional* readjustment takes place, first of all of the periodontal fibers. These no longer appear to run in a nearly perpendicular direction from tooth to bone, as in Fig. 16, but in an oblique direction. This *functional readjustment* of the periodontal fibers can be very well observed in Fig. 17 (specimen of Fig. 12, stained after Mallory), and in Fig. 18 (higher magnification of area *I* from Fig. 17). Therefore, we find on the side of pressure, as well as on the side of tension, adjustments on the part of nature

tending to prevent loosening and sensitiveness of the moved teeth; *the conclusion from these findings is the demand for the use of gentle intermittent forces, in order to safeguard a painless, and, therefore, "biologic" treatment.*

Fig. 17.—Same slide as Fig. 12, stained according to Mallory; the same description as for Fig. 12, direction of movement toward the right side.

Fig. 18.—High magnification (100 times) of area *I* of Fig. 17. In the longer intervals between adjustments, we observe, due to the influence of function, a functional arrangement of the periodontal fibers (*Pf*); they now run in an oblique direction from the bone to the tooth; *Z*, tooth, *K*, bone trabeculae arranged in the direction of force (arrow), but not yet rearranged under the influence of function.

In Fig. 19, the general view of a completely formed deciduous tooth is shown that was moved by a strong force. We notice the tipping of the apex and the formation of a distinct tension area on one side of the apex; at the same time, the blood vessels and nerves entering the foramen appear distorted. A reaction of the bone is lacking, because of the lowered vitality of the periodontal tissues. For the same reason, there appear numerous cementum resorptions all along the side of pressure, although these resorptions do not reach into the dentin. Fig. 20 illustrates a larger magnification of the area *K* of Fig. 19. In Fig. 21 the apical area of a corresponding section is reproduced, and also here the phenomena just described may be clearly observed.

The accusation which has been raised by several authors, namely that the Angle arch with its ligatures uses too strong forces, is certainly not justified.

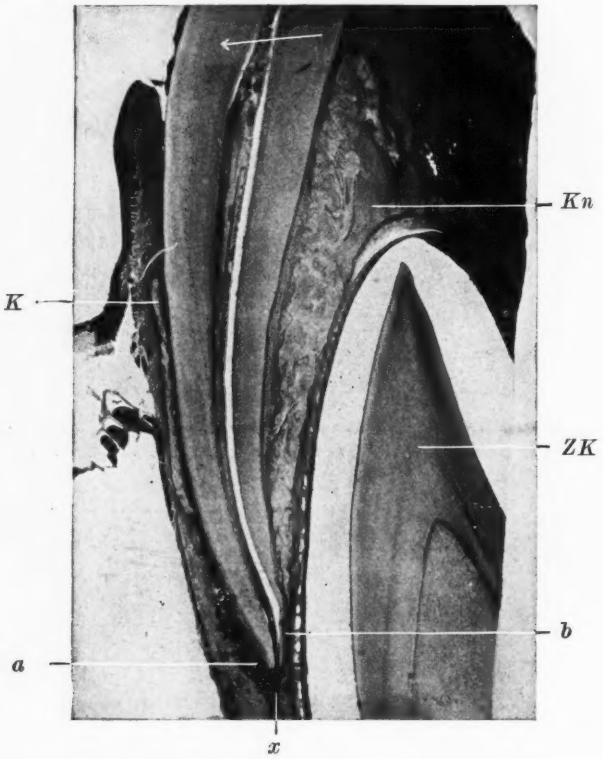

Fig. 19.—Application of strong force for thirty days; direction of movement indicated by arrow; magnification 10 times; *no signs of starting shedding;* compact bone (*K*) on the labial side (pressure) nearly unchanged, though somewhat thinned throughout; the apex of the tooth is dislocated; at *a* area of tension, at *b* area of pressure; due to the dislocation of the apex, the nerve-vessel-bundle was bent (at *X*); bone trabeculae (*Kn*) above the tooth germ (*ZK*) are in a state of rest; compare with Fig. 5.

The Angle arch may be used for "biologic" action, just as well as the lingual arch may be used for "pathologic" action. Even Mershon uses the labial arch in many instances,[10] certainly without sacrificing his own ideas.

Korkhaus states[11] that "the advantages of the biologic school, namely: attachment through contact only, gentle stimulating forces, minute adjustments, well-defined action and synchronism of all the different tooth movements, may be derived just as well from a labial as from a lingual arch."

Schwarz, however, contends[12] "that treatment carried out with the Angle arch and ligatures, produces intermittent forces and therefore the dangerous

phenomenon of 'jiggling,' when the teeth move first forward and then partly backward again;'' he further contends that ''this jiggling, which means a repeated change in the direction and in the amount of the pressure applied within a short period of time, is by many authors being made responsible for extensive root resorptions.'' These statements hold good only when treatment is carried on in an incorrect way. It also is evident that the amount of force used can in itself not be made responsible for the root resorptions (see Part II). If a band with a spur is placed on the tooth, and the tooth is then ligated to the arch wire, and if care is exercised in tying this ligature so that it is not weakened by twisting it (otherwise, it is liable to break very soon), then the ligature may stay in place for weeks or even months. This is especially true of ligatures

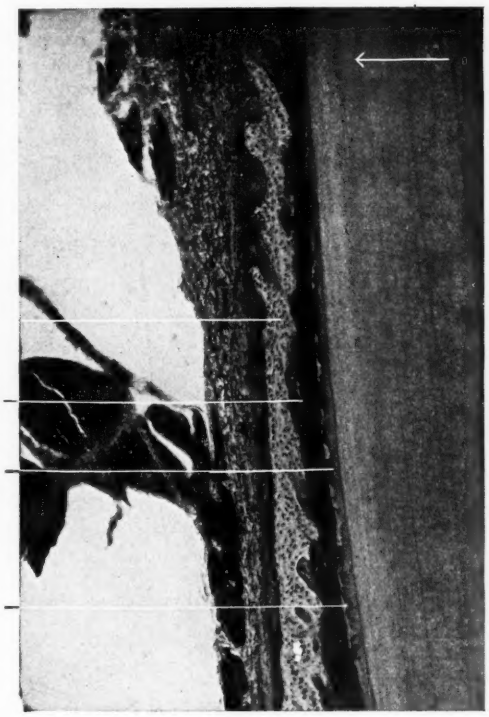

Fig. 20.

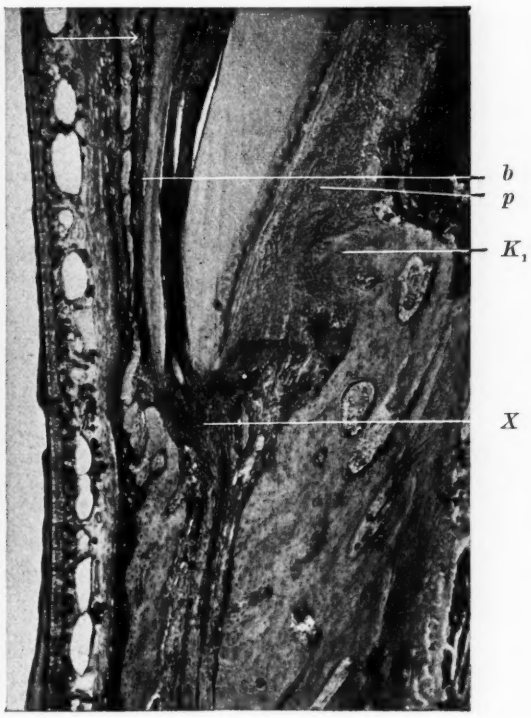

Fig. 21.

Fig. 20.—Higher magnification (50 times) of the labial side (pressure) of Fig. 19; application of strong force; the periodontium (*p*) is in a pathologic condition; it represents a homogenous anuclear mass with numerous blood clots and thrombosed blood vessels; *no reaction of the bone* (*K*), no osteoclasts; *extensive resorptions of the cementum;* between the resorptions, there are a few small islands of normal cementum (*c*); direction of force indicated by arrow.

Fig. 21.—Higher magnification of apical region of the same tooth as Fig. 19 (adjoining section). Application of strong force; the movement of the crown is indicated by the arrow; the movement of the root (in the opposite direction) produced a bending of the nerves and blood vessels entering the foramen at (*x*). The periodontal space is enlarged at *p* (area of tension), and narrowed at *b* (area of pressure); K_1, newly formed bone trabeculae arranged in the direction of the force.

which have been threaded through holes in the arch, in order to prevent tipping in the frontal plane.[13] The adjustments are only made by turning the screws. Because of the thinness and great elasticity of the modern orthodontic materials, such a procedure produces not an unyielding, but a gentle force; this force remains active for a certain time, namely until the slight lateral bend produced by the tightening of the screw has again assumed the original passive form of the

arch. It may also be mentioned that this bend in the arch should never be large enough to be noticed with the naked eye.

To this phase Kantorowicz makes the statement that the slight tension in the main arch produced by the tightening of the screw acts as a buffer if sufficiently gentle and elastic wires are used. Korkhaus remarks that when the highly elastic precious metal arch is used instead of the comparatively rigid German silver arch, the intermittent force of the screw is being transformed into a more or less continuous pressure, because of the resiliency of the arch wire.

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THE PHILOSOPHY OF AS-IF AND SIMON'S ORBITAL LAW OF THE CANINES, TOGETHER WITH CERTAIN REMARKS ON THE SKULL OF AN IDIOT*

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IN MARCH, 1924, Dr. Paul Simon delivered an extremely interesting lecture before the American Society of Orthodontists entitled "On Gnathostatic Diagnosis in Orthodontics" in which he explained his own orthodontic methods and proposed an entirely new system of orthodontic diagnosis and treatment. This lecture[1] was published in December of the same year and at once gave rise to a great deal of controversial discussion among orthodontists; it was not, however, until 1927 that certain of the more fundamental views expressed by Simon were investigated, found wanting, and in consequence adversely criticised by an anthropologist, Connolly,[2] and an orthodontist, Broadbent.[3] Since then much controversial matter dealing with Simon's views has appeared in various journals, but it was not until 1926 with the publication of Simon's book in English under the title of *Fundamental Principles of a Systematic Diagnosis of Dental Anomalies* with the subtitle "With an Explanation of a New Classification Based Upon Gnathostatic Methods of Investigation, a Handbook for Research and Practice, With an Appendix on the Norm-Concept in Orthodontics,"[4] that the English-speaking reader was at once enabled to study Dr. Simon's methods in greater detail than it had hitherto been possible to do through the medium of the 1924 paper. The translation of the book was very proficiently carried out by Dr. B. E. Lischer, an experienced orthodontist, apparently equally at home in German and in English. Although I have not seen the German original, the English edition reads like a singularly faithful and literal translation of the German text. The sentences all bear the marks of an original German idiomatic construction, and are in consequence often somewhat involved, furthermore Dr. Simon's style is rather heavily florid so that it is often difficult to grasp the root of his meaning for the abundance of the blossoms that bloom in such profusion in the verbal spring of his exposition—all of which makes very difficult reading: Simon's shorter paper of 1924 contains most of the ideas fundamental for his theories and methods, and the reader—at his own discretion—might more profitably consult this rather than the larger work in order to gain a reasonably clear conception of Simon's ideas.

In this paper I propose making a brief, thoroughly impartial, and purely scientific analysis of Simon's views. I should state at once that I am not an orthodontist but an anthropologist. I have, however, in an anthropologic capacity, been associated with orthodontic thought and practice long enough

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to have learned something of its problems. I should add further that I have not the slightest desire to participate in any such acrimonious discussions as Simon and some of his critics have indulged in; my purpose here is merely to contribute toward the discovery of the truth and the proper statement of it.

Orthodontics is a practical branch of knowledge, an *art,* the object of which is primarily curative and to some extent prophylactic. As an art it seeks to base its practice upon theoretical considerations, *science.* It should depend, therefore, to the largest extent upon the validity of these latter theoretical considerations whether the practice of them will lead to the establishment of the desired results. Ultimately, however, whether we take *validity* or *utility* as our criterion makes very little difference in the face of practical consequences—the practical consequences alone will determine the validity or utility of our theory. If our practical results are unsatisfactory, then the utility of our theory is thus proved to be valueless and its validity for our purposes nil. The obverse is also true, if our practical results are satisfactory and the theory supporting them demonstrably false, then the utility of our theory is proved and its validity for our purposes substantiated. Now, this latter view forms a syncretic expression of both the pragmatic and the fictionalist philosophies. Pragmatism says, an idea which is useful in practice proves thereby that it is true in theory—that what works is true. Fictionalism holds that a demonstrably untrue idea may have great practical value and may therefore be accepted *as-if* it were true. It is this last conception of philosophy that Simon makes so much of in the last chapter of his book.

Without wishing to appear the least patronizing, I think it ought to be said that orthodontists in particular and the dental profession in general owe Simon a great debt of gratitude for introducing such discussions into the field of dentistry. If Simon's work, however wrong or right it may be, will stimulate some orthodontists to inquire for themselves into the bases of scientific thought and method, he will, in my opinion, have rendered a very great service indeed to orthodontia.

To most thoughtful scientists the philosophical views invoked by Simon are of a somewhat elementary nature, but for all that none the less valuable. Here, however, I shall be concerned not so much with these views as with Simon's use of them.

In order to apply the theory of fictions to any particular group of observations it is first of all necessary to prove the practical value of an acknowledgedly false idea. I shall show that Simon has failed to do this, and that his data and arguments do not in any way satisfy the demands of scientific demonstration according to either the theory of fictions or any other scientific standard.

Fictions are of two kinds: good and bad. A good fiction is one that, though it can be demonstrated to be false or contradictory in itself, like the nondimensionality of a point, a nothing which is at the same time a something, a something which is at once a nothing, or like the *homme moyen,* the *average man* of Quetelet (whom Simon cites) who is a fictive standard to

whom no man conforms but to whom all men, as in medicine, are expected to conform, are treated *as if* they ought to conform, such constructs are within the universe of discourse in which they are used perfectly valid relative to the system of ordinates composing them. Bad fictions do not possess such a validity. To illustrate: if I say that all men are mortal, that is a *fact;* if I say that all men have a pulse of 72, that is a *fiction,* which works excellently in practice but is obviously not true for all men; now if I say that all men have a pulse of 120 that is false because most men have a pulse of 72 and a pulse of 120 occurs only in exceptional instances, as a fiction the worthlessness is proved because in practice its value is nil.

I shall show that Simon's fundamental constructs such as his planes and orbitocanine relationship are invalid among themselves, and therefore his system must at most be regarded as a bad fiction.

In what follows whenever I have occasion to mention Simon's views I shall for the most part allow him to speak for himself and in his own language so that there may be no question of misquotation. The source of my quotations from Simon will for the convenience of the reader, be indicated by a letter followed by the page number: letter *a* will refer to the 1924 article and letter *b* to the 1926 English translation of Simon's book.

The first part of Simon's book is devoted to an examination and criticism of the more important classifications of dental anomalies, at the conclusion of which he states that "This much is clear, the problem of classifying dental anomalies has not been solved by previous investigators, and it cannot be solved by the methods thus far employed. Hence if we are to achieve any advance we must approach it from a new point of view and employ different methods." (b 48.)

Then Simon tells us that "after many years of assiduous investigation and study" and the making of "many measurements on the basis of Angle's doctrine" he found the latter's "assertion that, in general, the maxillary first molars had a permanent place, so that they might represent, as it were, the starting point of measurement" to be "wrong." (a 1.) He then goes on to say "Angle himself was surely convinced that his assertion represented a real truth, a natural law. I have reflected a great deal upon the character of this law and have found it to be a fiction. Such a fiction is in question when some one makes a temporary statement, in order to be able to come to a practical conclusion at all, since it is impossible to recognize the real and natural state of affairs on account of its complication. Such a fiction cannot consequently claim any scientific truth, nor does it require any, but it can only claim the greatest possible usefulness. . . ." (a 3.)

Now, in reply to all this, it should be said that Simon has nowhere produced the slightest evidence which could in any way be construed as disproving Angle's doctrine of the constancy of the maxillary first molars. Nowhere has he stated the number of cases investigated and the particular results obtained for each; nowhere has the slightest indication been given of the nature of the method employed—I mean technical not technological—in the evaluation of his data; and nowhere are we provided with detailed figures or a summarized

statistical analysis of them; all that we are provided with are a considerable number of dogmatic statements, not one of which is supported by that evidence which we are accustomed to expect in the postulation and proof of a new theory. From all this it transpires that Simon has nowhere in his own writings refuted the value of Angle's doctrine, but has merely stated that he has found it to be "wrong"—a statement which may or may not be true; such statements are quite valueless unless they are supported by an adequate amount of evidence, and this evidence has certainly not been forthcoming in Simon's works, so that as far as Simon's criticism is concerned Angle's doctrine remains quite unaffected. However, all this has very little connection with Simon's own particular system of diagnosis and treatment, which, of course must be judged solely upon its own merits. The foregoing discussion has merely sought to show, as briefly as possible, that Simon has tried to justify the elaboration of his own system of orthodontic diagnosis upon the ground that Angle has been proved to be "wrong." It seems clear that he has not proved Angle's fundamental tenet to be wrong; the justification for his own work must therefore be sought elsewhere. Simon does find a justification elsewhere. He believes his own theory to possess greater practical value than Angle's, not so much as he would have us believe because Angle is wrong and Simon is right, but because in conformity with the theory of fictions he believes his own theory to possess a greater practical *utility* than Angle's—this is a perfectly legitimate justification—if only it were true.

In what follows I shall consider Simon's methods and principles with a view to determining their real value.

In order that there shall be no doubt as to what Simon really means, I shall have to quote him at some length.

"The exact procedure of making a diagnosis," he says, "rests upon cephalometric principles; that is to say, the teeth are not studied an measured in themselves, but in their relation to the head or skull. It is not practical to take the necessary measurements on the living; it is much better to make reproductions, for thus the measurements can be made in a more convenient and surer way. . . ." (a 3.)

"We need two kinds of reproductions, one of the teeth, the other of the head—that is to say, only of that part important for us. The first we get by the gnathostat model, the other by the photostat model." (a 4.)

The gnathostat "model is marked after three determined planes of the head or skull. The upper plane of the model is identical with the so-called 'Frankfurt horizontal plane' or, as it is more shortly called, the ear-eye plane. Imagine this plane to be a section made through four points of the head, viz., the two orbitalia or eye-points and the two tragia, or ear-points; the former are situated on the lower edge of the orbit just below the pupil, if the patient is looking straight ahead. The ear-points are situated on the upper end of the tragus. This ear-plane is, therefore, of great importance, and has for the last forty years been of great significance also in anthropology, on account of its being the physiologic horizontal plane; that is to say, if somebody holds his head erect in equilibrium, that plane is absolutely horizontal. It is quite clear, that

holding the head in such a position, you will get a right impression of the esthetic effect of an anomaly. But of much more importance is the fact that we can only make measurements when all the heads and all the teeth are marked alike." (a 4.)

Here, however, it might be appropriate to point out that the Frankfurt horizontal is a plane or orientation for the skull and not for the living head. There is no Frankfurt horizontal for the living head conventionally agreed upon by anthropologists. It is very doubtful, in any case, whether tragial and fleshy orbital points can be relied upon to yield a sufficient degree of accuracy in repeated orientations of the same head to render the results obtained strictly comparable. There is some adipose tissue between the skin and the orbicularis oculi, its decrease or increase may have quite a considerable effect upon the position of the orbital point as determined by Simon; however, it is quite possible that it may not. But how is it possible to determine that the patient is always looking straight ahead? How is it possible to ensure that the pupils of his eyes are always in the same position? To this Simon responds that the eye-ear plane will automatically put the head in its "physiologic horizontal plane." Now this statement has often been made, even by anthropologists, but the fact is that it is quite untrue, for as I pointed out in a paper published in 1927[5] the true horizontal in which the living head is carried is determined by the visual axis of the individual. This axis is always parallel to the earth's surface when the individual is looking straight ahead of him at some extracephalic object through the center of which the axis of vision passes; the center of the extracephalic object and the centers of the pupils determine the physiologic horizontal plane of the head. This plane can be determined with a great degree of accuracy by optometric means. I have no doubt that the physiologic horizontal is subject to a considerable amount of variation among different individuals and in relation to the Frankfurt horizontal, but this requires empirical verification. Now, were a vertical to be dropped at right angles to the pupil when the head is in the physiologic plane, it would, I should surmise, constitute just such a vertical as Simon speaks of using but actually does not use, for his orbital line is one that is at right angles to the Frankfurt horizontal and not to the physiologic plane of the head.

To continue with Simon: Having emphasized the necessity for a three-dimensional system of measurement he describes two additional planes, the three planes together possessing "the mathematical quality of being rectangular, that is to say," all standing "at right angles to one another." (a 4.)

"The second plane . . . is the median-sagittal plane, which also may be called symmetry plane, because a section made in this plane through the head will separate it into two nearly equal parts. For our purpose it is best to make this cut through the raphe-palati, perpendicular to the ear-eye plane. The whole raphe is not used from front to back, but only two points as far occipital as possible." (a 5.)

"The third plane is the so-called orbital plane . . . This plane intersects the two eye-points and stands perpendicular, both to the ear-eye plane and to

the raphe-median plane; it is, consequently, a frontal plane, with the help of which we can measure the sagittal anomalies. (a 5 and 6.)

Simon then goes on to state that a gnathostat impression is taken of the patient and describes the method of performing this operation in detail (a 6.) The impression taken includes the dental arches and palate of the maxilla. The mandibular impression is taken in the usual way. "It is then put together with the upper impression in natural occlusion and fixed with wax by means of some small wood sticks." (a 9.)

"The next problem is to transfer the median plane" and the orbital plane to the model. (a 9.) "This is done by means of the 'symmetrograph' "; this instrument consists of a metal pencil which "can be moved only in one plane and exactly perpendicular to the base plate. The upper model is put on this plate with its base turned until the point of the metal pencil touches at least two points of the posterior raphe, which have purposely been marked. Then the model is fixed in position with the four screw pins. Now we can readily draw a line round the model with the metal pencil and this line being situated in the desired raphe-median plane, it passes through the raphe and is perpendicular to the eye-ear plane.

"There yet remains the orbital plane. It is marked in the same way with the symmetrograph, only the model must be turned to ninety degrees and the metal pencil must be adjusted on the orbital marking, which we made previously with the pointer of the orbital marker." (a 10.)

"Now what object has such a gnathostat model? It has a double object. The first consists in making measurements. We collected several hundred cases of jaws with correct anatomical occlusion and examined them with the gnathostat. These jaws had all their teeth, and all of them had their right contact and the right occlusion. It was then observed that in most of these cases the orbital plane passes through the cusps of the maxillary canines. This is an incontestible truth, for which we find various explanations, for instance, from the history of evolution, from physiology, etc. The short space of time at my disposal prevents me from entering into a more detailed discussion of this subject. I should like to call your attention to Fig. 2. It shows two skulls, one of an individual of eighteen years, the other of five years, placed next to and one above the other in such a way that the ear-eye line and the orbital line fall in one direction. You can now observe that the growth of the face proceeds in a manner which exemplifies the existence of the orbital law of the canines, for though the jaw from five to eighteen years becomes much longer on account of the eruption of the molars, the relation of the front part of the jaw remains the same. This fact is very important for diagnosis, since it justifies the practical rule that the canines are normal when their cusps are in the orbital plane." (a 11 and 12.)

"In conclusion of my explanations I must come back once more to the beginning. I have said that the dogma of the molar constancy represents a *fiction*, and that I would place in its stead another and better fiction. I must briefly call your attention to this point, because it contains the essential theory of my system. You have seen that I judge and measure the anomalies of the

jaws by comparing them with a determined normal law [sic. jaw?] This normal jaw is not, however, a natural jaw. It is not by any means a specially fine and regular jaw of any individual, but this normal jaw that we put as its basis, as an example, as an ideal, does not exist in reality; it is a fiction, calculated as an average from a possible large series of individual cases." (a 24.)

Now, I have already indicated that Simon's horizontal plane, the Frankfurt horizontal, does not, as he believes, correspond to the normal physiologic horizontal of the head; it follows from this that his orbital plane cannot be at right angles to the said plane, it now remains to show that his sagittal plane is quite as invalid as the foregoing two from another standpoint, even though it would follow from what we have already said that this plane would be an inaccurate sagittal when projected in relation to an horizontal which is not what it is alleged to be.

The median sagittal plane is determined by projecting from two points on the palatine raphe "as far occipital as possible" a perpendicular at right angles to the ear-eye horizontal. Now, it should be clear that an arbitrary selection of any two points upon the median palatine raphe "as far occipital as possible," might produce a very inaccurate conception of the situation of the mid-sagittal plane of the head. Apart from the fact that the raphe itself might be subject to certain irregularities, the situation of the maxillary palatine structures in relation to the rest of the cranium may be oriented in such a manner as to throw the apparently normal relation of the palatine raphe considerably out. A glance at Fig. 2 will show to what an extent this may occur; this case represents an example of extreme deformity, but none the less serves the purpose of indicating the degree to which the palate may be deflected from its normal situation in any patient who may present himself to the orthodontist. The figure is from a skull which is fully described in the appendix to this paper, but here it would be as well to remark that the palate in this case is broader and longer on the left than it is on the right side, and that its median palatine suture deviates at least 5° laterally and to the right of the normal median sagittal plane.

Surely, it would have been a better plan in order to obtain the median sagittal plane to have jettisoned the median palatine raphe altogether and have determined the said plane by simply bisecting the porion axis.

Simon's three plane system is in the manner of construction of each of its ordinates a faulty one. Connolly[2] has proved that the orbital points conventionally agreed upon as the *orbitalia* do not stand in any fixed relation to any other facial parts. He writes: "The distances of the upper and lower orbital points from the level of frontomolare likewise show great variation, not in any way correlated with the size or form of the orbits. There is obviously a great variation in the dimensions of the facial units, and it is evident from the examples pointed out that Simon's norm could not successfully be applied in these cases. Our series is sufficiently large to illustrate typical conditions in the white race. The crania are representative of the principal European races and indicate the normal variation. A glance at the tables shows clearly that the lower orbital points have not a definite position with respect to other facial

parts. Hence, when the lower orbital points are placed relatively low, due to factors we have seen, the orbital plane would pass behind the canines; when placed relatively high, the orbital plane would pass in front of the canines; and in both cases the teeth might be perfectly normal in position.

"We must note further that the lower orbital points would not always be under the pupils in the living, as Simon implies, for the orbits of males often slope obliquely downward and outward. This in itself would not change the position of the orbital plane. But another kind of variation would influence its position, especially when linked with the preceding. This is the angle of the orbits to the Frankfort horizontal. Frequently, the orbital height is at right angles to the Frankfort horizontal, but it may be inclined downward and backward, thus bringing the orbital plane farther back." (pp. 77, 78.)

These findings of Connolly have been characterized by Simon as irrelevant and beside the point[6]; this, I completely fail to see, if anything *is* irrelevant then, I am sorry to say, it is Simon's criticism of Connolly's work. Connolly has defended his thesis against Simon's clever criticism quite successfully, and the reader should refer to it.[7] Finally, the recent work of Linder[8] who has made a biometric investigation of normal dentures including the relationship of these to the face in individuals of various ages proves beyond a shadow of doubt that Simon is wrong upon every one of the points he attempts to establish. Readers are urged to consult Linder's paper for themselves, for it represents a model of what such a paper should be.

The invalidity of Simon's constructs and the disproof of his observational data lead to the judgment that the practical bases supporting his theoretical system are wanting in that integrity sufficient to confer upon his theory the noble character of a fiction, for a false fiction is not a fiction. But when all this has been said, the fact remains that Simon's practical results have not been affected one whit, whatever those results may be. The little I have done has been to direct attention to the defects of some of his fundamental constructs and the findings of others proving the invalidity of Simon's so-called "laws." If, in spite of all this, Simon can prove the *practical* value of his system by the production of *practical results,* which are superior to those obtained by any other system of orthodontics, Simon may yet redeem the declining value of his theory as a fiction; none the less he can never hope to demonstrate the absolute value of such laws as his orbito-canine, for these have been once and for all disproved.

The idiot skull described in the appendix, dystrophic though it is, illustrates in high relief, as it were, some of the defects of Simon's views. Simon speaks, of course, only of normal skulls in the determination of the biometric mean to which abnormal dentures are to be approximated. The denture in this skull is an abnormal one, but I am not by means of it attempting to demonstrate the already demonstrated invalidity of Simon's "laws." I merely express the curiosity to know what Simon would have done with such a case during the lifetime of the individual. Simon might reply that the question does not arise, that this skull is absurdly out of the range of such as would during life present themselves or be presented for orthodontic treatment. Possibly this may be so, but what if the disorders were a little less extreme?

Appendix

Observations on the dystrophic skull of an idiot

The skull here described first attracted my attention in a case among a number of others because of the unique appearance of its nasal bone—which appeared to be exceedingly broad and high and of exceptional and unusual form. Upon closer examination of the skull a most remarkable series of deformities was observed. These are described below for such interest as they may possess for those concerned with the study of disorders of growth.

The available history relating to the skull is that it was taken from the body of a dissecting room subject in the Anatomical Laboratory of Bellevue Hospital Medical College, New York University (Body No. 3163 N. C.). The record affords the following information: The body was that of a white male who died of septicemia on March 1, 1926, at the age of twenty-three years. The name of the subject indicates an Italian origin. Death is recorded as having taken place at a children's hospital in New York City. In response to a request made to the authorities of this hospital for a history of the patient no reply was forthcoming. The preparator to the Anatomical Laboratory, however, informs me that he distinctly remembers this skull being recovered from the cadaver of an individual the whole of whose body was generally deformed, "undoubtedly an idiot." The fact that an individual aged twenty-three years died in a children's hospital would certainly lend some support to the preparator's statement that the individual to whom the skull belonged was an idiot, and as we shall see from a study of the skull itself he could hardly have been anything else.

For convenience in description the normae of the skull will be described in succession.

The more important general proportions of the skull are as follows:

Cranial capacity (by formula)	1140 c.c.
Maximum length	152.0
Maximum breadth (Euryon-Euryon)	122.0
Cranial index	80.2
Bistephanial breadth	115.0
Bifrontomalar breadth	110.0
Bifrontotemporal breadth	110.0
Bisphenoid breadth (infratemporal crest)	63.0
Bizygomatic breadth	118.0
Bi-auricular breadth	95.0
Bi-asterial breadth	103.0
Bimastoid breadth	111.0
Basion bregmatic height	120.0
Basion vertex height	123.0
Opisthion vertex height	136.0
Auricular vertex height	147.0
Basion prosthion length	80.0
Opisthion prosthion length	105.0
Nasion basion chord	93.0
Nasion lambda chord	143.0
Lambda prosthion chord	170.0
Nasion opisthion arc	322.0
Bi-auricular arc	288.0
Foramen magnum length	28.0
Foramen magnum breadth	25.0
Nasion prosthion height	82.0

Nasion akanthion height	54.0
Rhinion akanthion height	25.0
Nasion rhinion height	28.0
Nasal bone breadth, maximum	34.0
Nasal bone breadth (rhinion level)	21.5
Total nasal height	61.0
Total nasal breadth	34.0
Nasal index	40.9
Right piriform height	32.0
Left piriform height	33.5
Right anterior maxilloalveolar height	24.0
Left anterior maxilloalveolar height	21.5
Palatal length	48.0
Palatal breadth	45.0
Palatal index	93.7
Palatal height	13.0
Left interpalatal breadth (opposite PMI buccally to the median palatine suture)	18.5
Right interpalatal breadth (opposite PMI buccally to the median palatine suture)	16.0
Left interpalatal breadth (opposite M I buccally to the median palatine suture)	23.0
Right interpalatal breadth (opposite M I buccally to the median palatine suture)	19.0
Left interpalatal breadth (opposite M 2 buccally to the median palatine suture)	23.0
Right interpalatal breadth (opposite M 2 buccally to the median palatine suture)	22.0
Left interpalatal breadth (opposite tuberosity buccally to the median palatine suture)	22.0
Right interpalatal breadth (opposite tuberosity buccally to the median palatine suture)	19.0
Bituberosity breadth	41.0
Right tuberosity prosthion chord	51.5
Left tuberosity prosthion chord	53.0
Right M 2 zygomaxillare height	28.0
Left M 2 zygomaxillare height	25.0
Right zygomaxillare orbital height	18.0
Left zygomaxillare orbital height	21.5
Nasion prosthion profile angle	93°

	Left Orbit	*Right Orbit*
Breadth from lacrimale to frontomalare	40.0	40.0
Maximum height	40.0	35.0
Orbitozygomaxillare to frontomalare chord	41.0	37.0
Orbitozygomaxillare to inferolateral angle	30.0	25.0
Orbitozygomaxillare to superolateral angle	44.0	38.0
Superior orbital height (frontomaxillare level)	16.0	10.0
Inferior orbital height (to frontomaxillare level)	24.0	23.0
Interorbital breadth (lacrimale to lacrimale)	40.0	

NORMA FRONTALIS AND THE ANTERIOR FOSSA

The general appearance of the face, which is not strikingly brought out in the photograph in Fig. 1, is bizarre. The left side of the face impresses one as having been compressed by some trophic or mechanical force posteromedially. The left side seems to be almost at right angles to the right side of the face (Fig. 4) which is of normal appearance. The left orbit is strikingly distorted. But the most immediately impressive character of the face is the unique form of the nasal bone, which rises like a broad-necked spearhead vertically above the supraorbital margins to run in a flat continuous plane with the frontal. Immediately above this bone a short vertical fissure may be seen opening into the cranial cavity; to the right of this two similar smaller fissures

may be seen. The frontal bone on the right side projects over the orbit; on the left it is deflected together with the left orbit posteromedially.

The Frontal Bone.—The proportions of the frontal bone are:

Bifrontomalar breadth	110.0 mm.
Bifrontotemporal breadth	110.0 mm.
Bistephanial breadth	115.0 mm.
Nasion bregmatic chord	77.0 mm.

While the left side of the frontal is deflected posteromedially together with its orbit, the right frontal projects over its orbit. At approximately the site of the frontal tubercle on the right frontal the bone appears to be somewhat callus in nature. The callus appearance of the bone extends over to the left

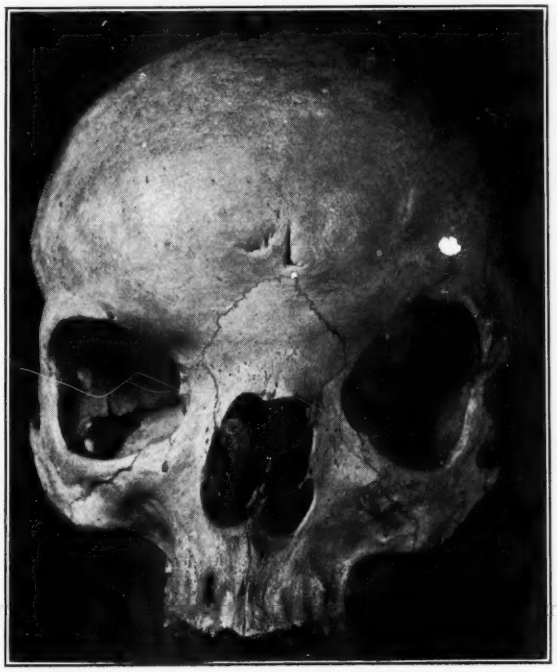

Fig. 1.—*Norma Frontalis.* Showing the remarkable nasal element which invades the frontal bone. Above are seen three traumatic fissures; below, to the left, may be seen the deformed orbit, and medially the deflected oblong "piriform" aperture.

frontal as far as the medial margin of the orbit. In just this region the anteroposterior thickness of the bone is greatest. The three fissures which are situated above the nasal bone open into the cranial cavity, the largest being the most widely open; it is some 10.0 mm. in height. Endocranially the fissures are situated immediately lateral to the frontal crest, the larger to the left, the smaller to the right. The involuted appearance of these fissures and the callus nature of the bone associated with them suggests a traumatic disturbance of the bony tissues in the nasofrontal and supraorbital regions of long standing.

The Anterior Fossa.—Within the cranial cavity the anterior margin of the crista galli seems to have been flattened out and its anterior margin deflected

slightly to the left. The cribriform plates are unusually depressed. The dimensions of the anterior fossa are:

Right Side		*Left Side*	
Length	53.0 mm.	Length	40.0 mm.
Breadth	62.0 mm.	Breadth	47.0 mm.

It will be observed from these figures that the area of the right side of the anterior fossa is considerably greater than that on the left (see Fig. 3). The orbitofrontal plates comprising the floor of the anterior fossa run more than

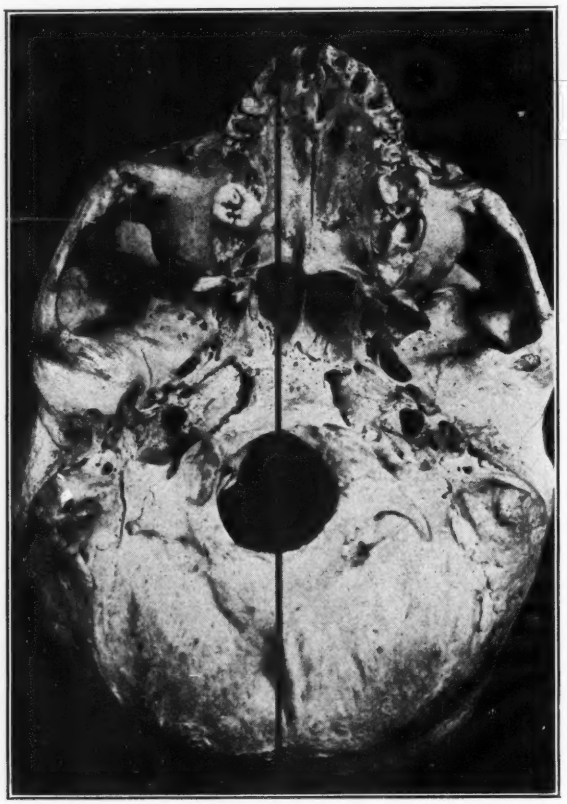

Fig. 2.—*Norma Basilaris.* This figure shows the skull bisected at right angles to the transverse plane of the mastoid processes. The deflection to the left of the midsagittal plane of the structures anterior to the basion may be clearly seen, particularly in the palatal region.

usually obliquely upward and outward. They are excessively thin, exhibiting but the faintest impressions made by the orbital gyri. The left orbitofrontal plate is appreciably higher than the right.

The left mediofrontal wall exhibits some unusually marked gyral impressions. On the left side there are two horizontal gyral impressions; on the right side there are no horizontal gyral impressions at all, but a number of rounded fossae are present traversed centrally by a single ascending impression.

The presphenoid is raised above the level of the cribriform plate and presents a thin broad posterior margin. On the left the small wing of the sphenoid rises high up on the mediofrontal wall corresponding to a position

about a centimeter above and behind the frontotemporal process on the externum. On the right the small wing curves round the pteric region and does not rise upward as on the left.

The Nasal Bone.—Perhaps the most remarkable structural entity in the skull is the nasal bone or nasal element. This resembles the form of a broad necked spearhead with its greatest diameter, 34 mm., at the nasofrontomaxillare, some 3 mm. below the site of the normal nasion. From these points the bone rises pyramidally to a height of 21 mm. to within 3 mm. below the large vertical fissure in the frontal bone. The total height of the bone is 28 mm. The inferior breadth at the rhinion is 21.5 mm. At the inferior margin in the midplane of the bone, there are two small foramina, one above the other,

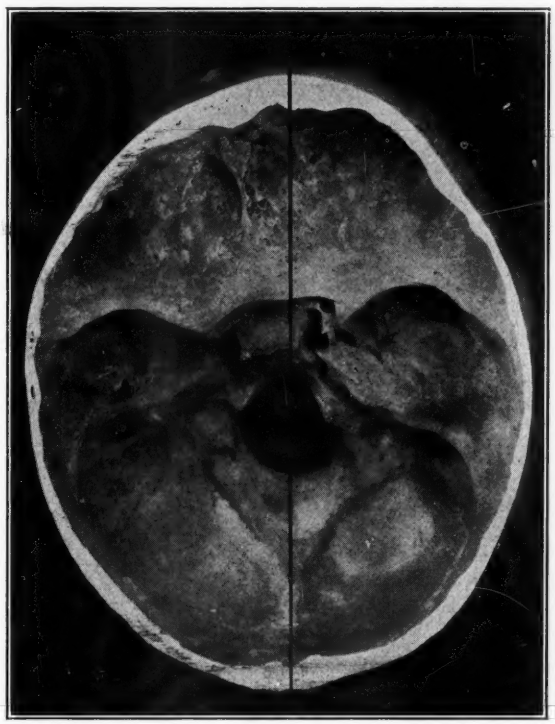

Fig. 3.—*Norma Verticalis.* The interior of the skull, showing the bisection of the skull at right angles to the transverse mastoid plane. The left posteromedial deflection is strikingly shown. Notice the flattened petrosal on the left side.

which may conceivably represent the remains of the internasal suture. They look more, however, like emissary foramina.

In the normal skull the nasal bones advance to within no more than 3 mm. below the supraorbital margins; whereas in the present case the nasal element advances 15 mm. above the level of the right normal supraorbital margin.

The normal superior nasal breadth is about 15 mm.; in the present case it is 34 mm.; the normal nasal height for a skull of this size is no more than 21 mm.; in this case it is 28 mm. The inferior breadth, 21.5 mm., is normal. Above the frontomaxillary region the bone is almost flat, below it is slightly arched but is still excessively flat when compared to the normal nasal bone of the Caucasian skull.

It seems a likely hypothesis in order to account for this peculiar nasal element, to assume that it originated as the result of osteoblastic activity following upon early extensive injury to the bones in the nasofrontal region. The nasofrontal region may have been so injured that repair of the whole area destroyed was necessitated, and in the course of repair osteoblasts emanating from the nasal bones made good the frontal area now occupied by the nasal element. Such an interpretation derives some support from the presence of the probably traumatic fissures situated above the apex of the nasal element, and also from the callus nature of the frontal bone in this vicinity.

Within the nasal fossa the middle nasal conchae can be seen attached to the lateral nasal wall and superiorly to the cribriform plate. The right middle

Fig. 4.—*Norma Verticalis.* The exterior of the skull, showing the almost spherical shape of the vault, the obliteration of the sutures upon it, and particularly the orientation of the left orbit in relation to the right.

concha is rather more inflated than usual. A superior concha cannot be seen. The inferior conchae are normal in appearance and relations.

The perpendicular ethmoidal plate is about twice the normal thickness, it is thickly and broadly attached to the posteroinferior margin of the nasal bone. Inferiorly the vomer is of normal thickness and is deflected to the left. The anterior nasal spine is normally developed, but there is no suspicion of a gutter or nasal ledge on either side of the nasal spine; the maxilla is here rather thin and high. The floors of the fossa are deep, the right being distinctly deeper than the left. The piriform aperture is oblong rather than pear-like in form, and is 33.5 mm. in height on the left side, and 32 mm. on the right. The superior breadth of the piriform aperture is 22 mm., and the in-

ferior 24 mm. The total nasal height from nasion to nasal gutter is 61 mm., and the breadth 25 mm. The nasal index is 40.9 (leptorrhine).

The Left Orbit.—The appearance of the left orbit is striking; it conveys the impression of having been subjected to a strong posteromedially inclined stress or strain, as if some force had been active in pushing or pulling it, together with the zygomatic and frontal bones medially and posteriorly. This impression becomes even stronger when the skull is viewed in *norma lateralis* (Fig. 7), for the zygomatic process of the frontal appears to be situated unusually near the coronal midplane of the skull. In a vertical view (Fig. 4) in which both orbits are visible the posteromedial torsion is most clearly seen, for the plane of direction of the left orbit differs markedly from that of the right. In the normal skull the orientation of the lateral margin of each orbit

Fig. 5.—*Norma Occipitalis.* Showing a symmetrical pentagonal form, with the lambdoid suture in a state of closure; the sagittal suture is completely obliterated.

in relation to the frontal plane is directed some 12° posteromedially; whereas in this skull the left orbit presents an orbital angle of 39°, and the right orbit an angle of 28°. The medial left supraorbital margin runs obliquely upward at an angle of 55° to meet the slightly marked notch at the center of the margin; from her onward the margin runs horizontally into the somewhat elongated perpendicular zygomatic process of the frontal.

The infraorbital margin is formed entirely of the zygomatic bone; whereas in the normal skull the zygomatic contributes no more than between half and two-thirds to the formation of the margin, while the maxilla contributes the remainder. The orbital height is 40 mm., and the breadth from lacrimale to frontomalare is equally 40 mm. Within the orbit the sphenoid runs upward obliquely unusually high above the frontomalare junction to meet the frontal plate at a sharp angle; at its junction with the plate it is penetrated by two

small foramina. The spine for the pulley of the superior oblique muscle is extremely well developed and may be seen projecting within the middle cranial fossa. The superior orbital fissure is very much broader than usual. The optic foramen is of normal dimensions. The inferior orbital fissure is markedly broad anteriorly, even though allowances are made for that part of the zygomatic bone which has been broken away anteriorly at the inferolateral sphenoidal junction, also the fissure extends to within 7 mm. of the orbital margin, whereas in the normal skull of the same size the fissure extends to no further than within 14 mm. of the margin. A furrow for the infraorbital nerve and artery is absent in the floor of the orbit but a foramen for the passage of these is present in the posterior margin of the floor. The infraorbital foramen is normal in form and position; it is situated some 16 mm. below the infraorbital margin. The superior and inferior zygomatico-orbital

Fig. 6.—*Norma Lateralis Sinistra.* Note the encroachment of the alisphenoid upon the zygomatic process of the frontal, and the excessive roughening of this process.

processes are extremely narrow, not extending for more than 8 mm. within the orbit. The lacrimal bone and crest have been broken away but the nasolacrimal orifice, which is present, is of unusually large dimensions.

The Right Orbit.—The right orbit is of normal form, being 35. mm. in height, and 40 mm. in breadth; its orientation to the frontal plane, posteromedially, is 28°, that is, 11° less than the left. The zygomatic contributes its normal two-thirds to the formation of the infraorbital margin. Superiorly, within the orbit, the zygomatic is slightly more dominant in its articulation with the orbitosphenoid than it is in the left orbit; inferiorly the zygomatic does not extend for more than 8 mm. within the orbit. On the floor posteriorly there is a slight suggestion of an infraorbital groove. The infraorbital foramen is normally situated some 10 mm. below the infraorbital margin, 6 mm. less than on the left side. Here, too, the superior and inferior orbital fissures

are wider than usual, but the sphenoid does not rise as high above the frontomalare level as in the left orbit. The spine for the pulley of the superior oblique is less marked than its fellow in the left orbit. The lacrimal bone and crest are normal, but the nasolacrimal orifice is even larger than on the left side. The optic foramen is normal.

The interorbital breadth is enormous, some 40 mm. from lacrimale to lacrimale, in a normal skull of this size the breadth does not exceed 23 mm.

The Zygomatic Bones.—The left zygomatic bone together with all its processes is oriented in a flat continuous plane with the orbit and frontal bone of the same side. Its broad marginal process is very sharply developed, it is some 11 mm. in breadth, while the frontal process is very narrow, being some 2.5 mm. in breadth. The usual foramina are present. The infraorbital height

Fig. 7.—*Frontolateral View.* The orbital deformation may be seen in this view, also the flat zygomatic bone and its abnormal relation with the lacrimal.

of the bone is 22 mm.; on the left it is 16 mm. The temporal process is 5 mm. in length.

The impression arising from the appearance of this bone on the left side is as if a force acting in a common posteromedial direction had been applied against it with some power and thus caused its flat surface and abnormal orientation. This is in conformity with the impression derived from the appearance of the orbit and frontal bone on the same side.

On the right side of the face the zygomatic bone is of normal appearance.

The Maxillary Bones.—Superiorly the maxillary bones are of normal appearance except for the fact that they are somewhat flat toward the piriform aperture; subnasally, however, they exhibit a very constricted appearance. On the left side the subnasal maxilla exhibits the effects of the same force which has affected the other structures on the same side; that is, it is inclined more

posteriorly and medially than the maxilla on the right side. The height of the left subnasal maxilla is 21 mm., and on the right it is 24 mm.

NORMA BASILARIS

The Palate.—The palate is dolichouranic in form, the maximum length being 48 mm. and the breadth opposite the second molar buccally being 45 mm., with a palatal index of 93.7. The bi-lateral incisor breadth is 27 mm., the bi-canine breadth 29 mm., the bi-first molar breadth 42 mm., the bi-second molar breadth 45 mm., and the bi-tuberosity breadth 41 mm. The incisive foramen is large and is situated to the left of the median palatine suture. There is a marked torus palatinus. The palatal height is 13 mm., which is rather high for a palate of this size, but conforms to the well-known observation that

Fig. 8.—*Norma Lateralis Dextra.* In this view the acrocephaly, or high vaulting of the skull is well shown, together with the steep ascent of the frontal. Notice the complete absence of any depression in the vicinity of the root of the nose. Posteriorly the marked occipital bulging is seen.

the idiopathic palate is a high one. The left maxillopalatine bone is slightly narrower than the right; although the breadth from the buccal margin of the maxilla to the median palatine suture is slightly greater on the left than on the right side, because of the greater diameter of the alveolus on the left side. The left interpalatal breadth (from the buccal margin to the median palatine suture) opposite PM I is 18.5 mm., on the right 16 mm., opposite M I left 23 mm., right 19 mm., opposite M 2 left 23 mm., right 22 mm., opposite the tuberosity left 22 mm., right 19 mm. The left palatine bone is 11 mm. in length and 15 mm. in breadth; whereas the right is only 5 mm. in length and 11 mm. in breadth, the lesser breadth of the palatine bone on the right side being due to the deflection to the right of the posterior palatine suture by, most probably, the vomer above which is attached to the roof of the palate and

which is clearly deflected to the right. The left tuberosity prosthion chord is 53 mm., the right 51.5 mm. The greater and lesser palatine foramina are present.

With the exception of the right second molar, the left premolars, and the left first molar, there are no teeth present in the alveolar body; all of them, with the exception of the right first molar which seems to have been lost a short time before death, having been lost after death. The third molars are absent, having presumably never developed, for there are no signs of them within the maxilla; the alveolus posterior to the second molars is well developed, unlike the alveolus that has lost a tooth. The right second molar is of normal form and in good condition. The left premolars and first molar, however, have been almost completely destroyed by caries. The form of the sockets would indicate that some of the teeth were of irregular form, particularly the right central incisor, the alveolar fossa for which is extremely large, while that for the left central incisor is comparatively minute. The socket for the left second molar indicates that this tooth possessed only two roots. The right side of the alveolar body is slightly higher than the left.

General.—The whole of the left side of the skull is situated upon a lower plane than the right.

In the basisphenoid bone just posterior to the vomer the foramen of the craniopharyngeal canal may be seen, which is probably continuous with the centrally situated foramen in the hypophyseal fossa.

The medial pterygoid plates are almost obliterated, but the hamular processes are very well developed. The superior third of the pterygoid fossa toward the scaphoid is obliterated on the right side by exostosis, and similarly almost completely so on the left.

The basilar suture is closed. The petrous and tympanic bones are normal in form, and all the usual foramina and fissures are present. The glenoid fossae are of normal form.

The left occipital condyle is lower, broader, and shorter than the right; both condyles possess postlateral alae.

The foramen magnum is of normal form, the length is 28 mm. and the breadth 25 mm.

The mastoids are very slightly developed. The right is bisected, anteroposteriorly, by a deep groove, possibly a head of the digastric; on the left there is a similar groove but faintly marked. The styloid processes are normally well developed.

The external occipital crest is extremely well developed, it is about 5 mm. in height, rather thin, and about 24 mm. in length. The superior nuchal lines are normally developed. There are no inferior nuchal lines.

Bisection of the skull at right angles to the plane of the mastoid processes reveals the fact, most strikingly, that the whole of the skull anterior to the basion has been deflected and raised to the left of the midsagittal plane of the head, so that anteriorly the bisecting chord passes through the middle of the right half of the palate (Fig. 2), instead of through the median palatine suture.

Within the skull the hypophyseal fossa is rather large, being some 15 mm. in breadth and 13 mm. in length; in the center of the fossa the foramen of the craniopharyngeal canal is present. A tuberculum sellae is absent. The anterior clinoid processes are normally developed; the posterior clinoid processes, however, are eroded and the dorsum sellae is very thin.

The left middle fossa is larger and situated on a lower plane than on the right.

The left petrous bone, within the skull, is very flat, and on it, slightly lateral to the internal auditory meatus, there is a marked elevation which simulates very strikingly the form of the superior semicircular canal.

The left cerebellar fossa is considerably larger than the right, more so than is usual. There is a crest for the transverse sinus, and a very slightly marked groove for the sigmoid sinus. On the right there is a well-marked groove for the transverse sinus opening into an exceptionally deep sigmoid fossa in which may be seen an extremely large mastoid foramen. The transverse groove on the right side is normally higher than the crest on the left. The internal occipital crest is not well marked and bifurcates below into two basi-occipital crests. The right jugular process is extremely well developed and overhangs to a slight extent the foramen magnum. An internal accessory condylar foramen is present on the left side. The hypoglossal foramina are normally present.

NORMA VERTICALIS

The calvaria has a rather spherical appearance. The sagittal suture is completely obliterated, there is not the faintest sign of it to be seen either ectocranially or endocranially. The coronal suture is completely obliterated on the left side; on the right side, however, a section of it may be seen extending from the pterion to slightly above the temporal crest, no evidence of the suture can be seen endocranially.

In the midcoronal plane, commencing immediately above the left temporal crest, there is a shallow depression in the parietal bone about 12 mm. in breadth and about 1 mm. in depth which extends to within a short distance of the sagittal region. This depression is seen endocranially as a slight elevation of the bone.

Two normally situated parietal foramina are present. In the frontal bone about 40 mm. anterior to the bregma three small emissary foramina are to be seen.

Endocranially the calvaria is remarkable for the irregularity of the course of the sagittal sulcus which proceeds fairly normally until it reaches the endocranial vertex when it curves abruptly over to the right and then anteriorly swings over more abruptly to the left, in conformity with the general deflection to the left and posteromedially of the left side of the skull. The usual foramina are present. The average thickness of the bone of the calvaria is about 2 mm. Anteriorly, above the frontal fissures already described, the thickness is 8 mm., at the point of the parietal foramina the thickness is 7 mm.; for the rest an average thickness of 2 mm. holds good.

NORMA OCCIPITALIS

In the occipital view the skull has a rather symmetrical pentagonal appearance (Fig. 5), being somewhat high and narrow. The occipital bone is of normal form. The lambdoid suture which is still evident exhibits in all its extent the heaped up type of almost completed synostosis. The external occipital protuberance is but slightly developed. There is some bulging of the bone superiorly.

NORMA LATERALIS SINISTRA

In this view the high vaulting or acrocephaly of the skull may be seen as well as the superior occipital bulging (Figs. 6 and 7). The temporal crests which are most marked on the lateral surface of the zygomatic process of the frontal, are otherwise of normal form and are normally well developed.

At the pterion where the posterosuperior margin of the alisphenoid meets the temporal bone, there is an appreciable bulging of the bone, as if it had been inflated at this point. The bone is extremely thin. In this area the lateral wall gives the appearance of projecting beyond the zygomaticofrontal plane, so that in viewing the skull in *norma frontalis* (Fig. 1) one can see the anterolateral wall very plainly projecting at the side. Such a projection cannot be seen on the right side. The dimensions of the squama temporalis are small, 48 mm. in length and 33 mm. in height; its form is diminutive but normal.

The zygomatic process of the temporal has the appearance of being rather short, but this is due to a hypoplasia of the process in the glenoid region which has caused the lateral glenoid margin of the process to be somewhat reduced. The process is continued posteriorly for a short distance when it becomes medially inflected above the glenoid fossa and is seen finally as a sharply marked supraauricular crest.

The anterior margin of the temporal shelf between the squama and the temporal process is 24 mm. posterior to the postorbital wall; this is a very small figure for the anteroposterior diameter of the temporal fossa. The mediolateral diameter of the fossa is 28 mm.

The alisphenoid is a narrow bone some 10 mm. in width; its anterior margin is situated within 4 mm. of the medial aspect of the lateral orbital margin! Actually the alisphenoid forms two-thirds of the postorbital wall. The anterosuperior portion of the alisphenoid encroaches upon the zygomatic process of the frontal. The height of the bone is normal, some 36 mm. from the infratemporal crest.

The sphenoidal, temporal, and mastoid group of sutures are all as patent as they would normally be in an individual of twenty-three years.

NORMA LATERALIS DEXTRA

In this view the remains of the coronal suture may be seen (Fig. 8). The temporal crests commence at the stephanion and continue normally well marked posteriorly. There is a slight bulging of the bone in the region of the stephanion but with little or no accompanying thinning of the bone. The

squama temporalis is similar in form and dimensions to that on the left side.

The alisphenoid is narrow but otherwise of normal form; its relations are normal.

The anteroposterior diameter of the temporal fossa is 30 mm., and the mediolateral diameter is also 30 mm.

The zygomatic process of the temporal is normally formed.

The general nature of the deformities exhibited by this skull may be summed up very briefly. The whole of the left side of the skull from the frontal aspect to the basion has been subjected to a force, or forces, which have deformed the left orbit and zygomatic bone, and caused the left side of the face to grow backward in a posteromedial direction. It seems that there were two forces at work on the left side, one, the primary, working on the anterior third of the left side of the skull from the frontal plane and being directed superiorly and posteromedially, and another, the secondary, in the posterior two-thirds of the skull working forward and downward, probably as a result of the pressure put upon the structures in this region by the backward thrust of those anterior to it. Thus, we find that the floor of the anterior fossa on the left has been raised, while the floor of the middle and posterior fossae on the same side have been depressed.

The fact of the nasofrontal trauma, the excessive development of the temporal attachment upon the zygomatic process of the frontal as evidenced by the roughened surface of this bone, and the invaginated encroachment of the alisphenoid upon this process and behind the orbit, suggest the possibility of a traumatic disturbance of the musculature in these regions, which may in part have been responsible, in the form of a strain, for the deflection of the upper left side of the facial bones; in any case, the muscles concerned, even if they were partially responsible for this part of the face, can only have acted as *post hoc* factors.

It seems most probable to suppose that severe injury at an early age to the nasofrontal region generated the whole host of deformities that followed. The superior portion of the orbicularis oculi must have been damaged, as well as the procerus, nasalis, and left frontalis, but it is hardly reasonable to suppose that damage to these muscles in any way affected the posteromedial deflection of the left side of the face. It is more probable that the early injury was definitely of a gross kind forcing the bones backward in a posteromedial direction, and that with repair the musculature in the injured regions served to maintain by a process of stress and strain the original disorientation. With premature synostosis of the calvarial sutures, particularly on the left side, there was an accompanying constriction of the growing brain, with associated deformities following this.

SUMMARY

A skull is described of a white male, aged twenty-three years, exhibiting a number of deformities particularly on the left side of the head.

The skull exhibits a unique nasal bone which has the form of a broad spearhead, the apex of which rises high into the frontal bone in a continuous vertical plane with the latter.

Above the nasal bone three traumatic fissures which communicate with the interior of the skull are visible. Surrounding these the bone is of a callus nature.

The orbit, the frontal, zygomatic, and maxillary bones on the left side are deflected backward in a posteromedial direction.

The right side of the face is normal but for the fact that the frontal bone, which has undergone a process of repair, projects rather more than usual over the orbit.

The left side of the skull is oriented upon a lower plane than the right.

The palate is of the idiopathic kind, narrow and high.

It is assumed that the cause of these deformities originated in early injury of a gross nature to the nasofrontal region.

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CYSTIC DEGENERATION OF THE MANDIBLE AS THE END-RESULT OF OSTEOMYELITIS FORTY YEARS PREVIOUS*

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THE cystic development in the following case is unusual from several standpoints, the extent of the involvement of the mandible without previous discovery, without the production of a pathologic fracture, and the possibility that the condition is the end-result of a condition of forty years' duration.

The patient, Mr. W., aged forty-six years, white, tailor by occupation, presented himself for examination complaining of the flowage of pus from the gum tissue in the neighborhood of the mandibular first premolar on the left side and extending forward to the midline. This pus, so he stated, broke through the tissue about a week before he appeared for treatment.

Examination of the mouth showed the presence of several small fistulas from which a thin serous-like pus could be seen draining. The gum tissues in the neighborhood of the fistulas appeared normal in color. There was no evidence of chronic inflammation or acute infectious processes. On first appearance one would be led to make a diagnosis of osteomyelitis of some standing. The patient did not complain of pain at the time of the examination and said that it had not been painful at any time. Anterior teeth were somewhat loose, others appeared normal. The lack of pain and lack of history of any acute infectious process seemed to rule out osteomyelitis or other conditions of a similar nature. The same thing made the diagnosis of an acute abscessed tooth very improbable.

Past history is interesting and may have some bearing upon the present condition. The patient states that at the age of six, forty years previously, he had what was then termed osteomyelitis of the mandible and was operated upon; a large portion of bone being removed in the region of the left mandibular canine. The operation was done extraorally, leaving a linear scar under the border of the mandible which is present to this day. He has noticed that his mandible has become somewhat thickened in the past two or three years, but the development was so slow that he was not definitely aware of it or alarmed about the condition.

X-ray pictures were taken of the mandible in anteroposterior and lateral projections and upon examination showed considerable degeneration of the mandible. Fig. 1, an anteroposterior projection of the lower portion of the head, shows a thickening of the anterior portion of the mandible, an extensive loss of substance, an impacted canine in the midline, and involvement of the anterior teeth. It is interesting to note that the entire root of the impacted left canine has been resorbed. When this tooth was removed at operation, it was found that all of the cementum and dentine had been resorbed, leaving only

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the enamel shell. A considerable portion of the roots of the right canine, the lateral and central incisors, and left first premolar have been resorbed by the cystic degeneration.

Fig. 2, a lateral projection of the head, shows the extent of the cystic degeneration on the left side, it extending distally to involve the mesial root of the second molar. One notices also the apparent loss of the lower border of the mandible and the buccal plate. Fig. 3, a lateral projection of the right side, does not show the involvement of the mandible as well as it should be, but the

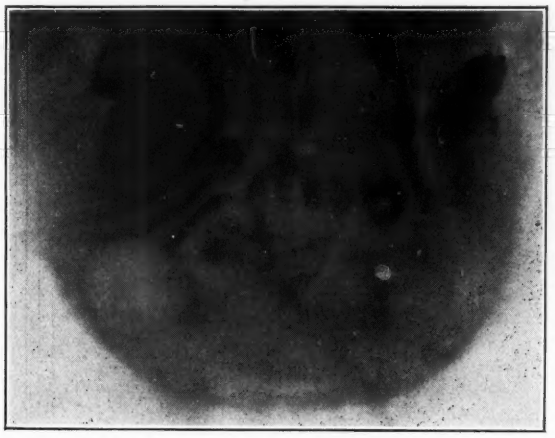

Fig. 1.—Cyst of the mandible extending from second molar on right to third molar on left. Resorption of all anterior teeth and root of impacted canine which lies in the midline.

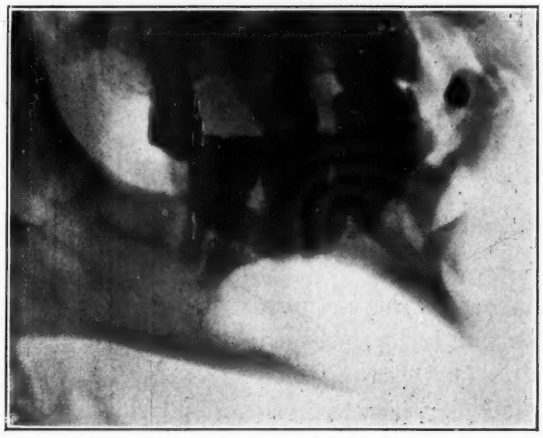

Fig. 2.—Lateral x-ray picture showing extent of the cyst on the left side. Note loss of buccal plate in the anterior portion of the jaw and almost complete loss of the lower border.

degeneration extends to the third molar on this side. This plate definitely shows the complete destruction of the buccal plate, a point borne out at operation.

Fig. 4 shows in a diagrammatical way the extensive involvement of the mandible, an almost complete destruction of the entire body of this bone.

The cyst was removed under nitrous oxide ether induction anesthesia. When the cyst was exposed, it was found that the cavity was filled with a dense fibrous granulation tissue and a very foul smelling pus. Possibility of a giant cell sarcoma was ruled out by the pathologic report, which stated the tissue was of a

chronic inflammatory type and showed no tendency toward malignancy. The source of the infection in the cyst seems to be definitely traced to the filling of a large cavity in a mandibular left second premolar about a year previous to the operation. The patient said that this particular tooth hurt a great deal for a period of about three months after it was filled and then suddenly stopped.

It seems very probable that the condition of the impacted tooth is not due to the resorption of a fully calcified root, but that the root never developed. Examination of the tooth shows that there is about the amount of calcification

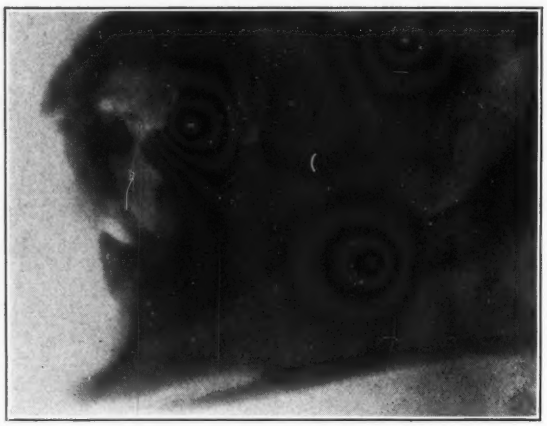

Fig. 3.—Lateral projection of right side of mandible showing extension of cyst to third molar region.

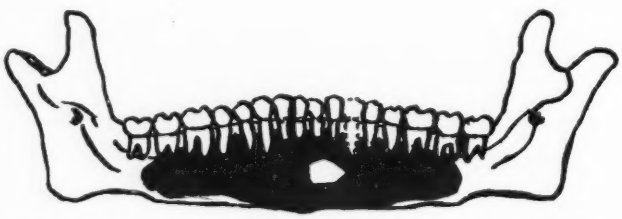

Fig. 4.—Diagram showing extent of destruction of body of the mandible. Crown of impacted canine in midline.

found in the canine tooth at the age of six or seven according to most tables of calcification. It does not seem unreasonable to diagnose this condition, therefore, as the end-result of an osteomyelitis at the age of six which destroyed the uncalcified portion of the canine follicle and caused an impaction. There do not seem to be other cases mentioned in the literature to support this contention, but the clinical picture makes such a diagnosis possible. The impaction and the damaged tissue surrounding what might be termed a foreign body predisposes to the formation of a cyst, and the end-result herein described.

ACUTE OSTEOMYELITIS*

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INFLAMMATORY reactions of the maxilla or the mandible may be classified according to the anatomic situation of lesions, into three divisions:

1. Periostitis—inflammation of the surrounding membrane of the bone or periosteum.

2. Osteitis—inflammation of the structure proper.

3. Osteomyelitis—inflammation of cancellous or medullary portion of bone.

It is important to realize that in reality no such definite anatomic limits of inflammation exist except in the very beginning of the disease. When the periosteum is inflamed, the underlying bone is always affected to a greater or lesser extent, while diseases involving the medullary cavity invariably affect the surrounding bone. In a similar way, if the bone itself is first affected, either the periosteum or medullary cavity or both are soon involved.

The acute form of osteomyelitis is characterized by pain, fever, chills, and attended by suppuration and rapid destructive processes which may occur either before or after surgery.

In acute osteomyelitis, usually the affected side of the face becomes greatly swollen, and there is difficulty in opening the mouth because of involvement of the insertion of the muscles of mastication. General symptoms such as fever and prostration are usually greater than those caused by an ordinary alveolar abscess.

In the incipient stage of acute osteomyelitis a dull pain or sense of fullness may radiate over the entire region affected. In the mandibular region every deep-seated pain radiating forward toward the mental foramen region should be considered significant and should be checked carefully in the differential diagnosis to eliminate the possibility of acute osteomyelitis.

The roentgenogram is of great aid in determining the pathologic changes due to periapical, periodontal and pericoronal disturbances, but in the very early stage it may not show any evidence of bone change of any osteomyelitic nature. In other words, the roentgenogram may show the results of disease about the teeth, but it may fail to show the extension of this disease to the bone marrow even though the infection has progressed this far. In some cases it may be ten days or more before any definite change in the bone structure can be detected by the roentgenogram.

The first bone change as shown by the roentgenogram is usually a small area of rarefaction due to resorption of the bone along the lower border of the mandible, or an area of lessened density or demineralization may appear in the body or ramus or the mandible.

*Read before the Florida State Dental Society, St. Petersburg, Fla., Nov. 14, 1931.

As the disease progresses, the symptoms already mentioned become more marked and the roentgenographic changes become more severe on account of the pressure caused by pus formation.

Osteomyelitis may be hematogenous in origin, or it may be caused by infection from the teeth or their surrounding structure. It is due to the presence in the bone of one or all of the following bacteria: staphylococci, streptococci, pneumococci, coli communis bacilli, tubercle bacilli, typhoid bacilli, or there may be other bacteria present, but these are the ones most commonly found in the greatest number. It has been my experience that the staphylococci are the offending organism in most cases. When you find a streptococcus invasion as the cause, it is much more dangerous, and you must remember that there is a likelihood of its going into a septicemia with a fatal termination.

Poisoning from chemicals, such as phosphorus (white or yellow), mercury or arsenic, may be the primary cause of osteomyelitis. The indiscreet use of hydrogen peroxide about the infected areas communicating with the bone, or in treating root canals of the teeth, may result in septic material being forced deeper into the bone, and causing osteomyelitis. It is a good policy to avoid the use of an oxygen liberating agent in a closed cavity.

Osteomyelitis in many cases originates from pericoronal, periapical, or periodontal infection, also from trauma, such as fractures, or wounds which lacerate or bruise the bone and soft tissue surrounding it. We often see cases of osteomyelitis following the removal of teeth while the tissues around the tooth or teeth were in an acute swollen condition with pus present, and especially in those cases where the extraction is difficult, and where in removing the tooth there is much trauma to the surrounding tissues. I do not say never to extract a tooth while in an acute condition, but I do advocate being very cautious; and I believe drainage should be established and maintained, if possible, until this condition has subsided before extracting the offending tooth. Of course, in those spongy cases where the tooth may be worked up and down in its socket upon percussion and it is necessary to remove the tooth in order that the pus may escape, you are justified in proceeding with the extraction.

In acute osteomyelitis the most important etiologic factor of all to be considered is the resistance of the patient. This is more important by far than the virulence of the infection. If a person is in a good healthy condition with high resistance, he or she would be able to overcome the attack from microorganisms which under the same condition would terminate seriously for a person with a lowered resistance. The eruptive fevers in youth, and later in life diabetes, tuberculosis, typhoid fever, syphilis, anemia, and other systemic disturbances, evidently pave the way for extensive involvement of the maxilla or mandible from local infective lesions.

Acute osteomyelitis occurs very rarely in the maxilla but is usually confined to the mandible. The reason for this is that in the maxilla there are thin cancellous outer plates of bone, forming sinuses into the vestibule of the mouth or into the antra or nasal cavities. The mandible is composed of a thick heavy body of cancellous bone covered by an outer cortical layer of dense bone. In the center of the mandible is found the mandibular canal which is

surrounded by cancellous bone, making it easier for infection from the mandibular teeth to travel to this canal than through the dense outer cortical layer of bone, thereby carrying infection further along the canal into the bone.

The complications of acute osteomyelitis of the maxilla and mandible are: disfiguration due to extensive destructive processes; involvement of other parts such as the maxillary sinus, the salivary glands, etc.; pathologic fracture of

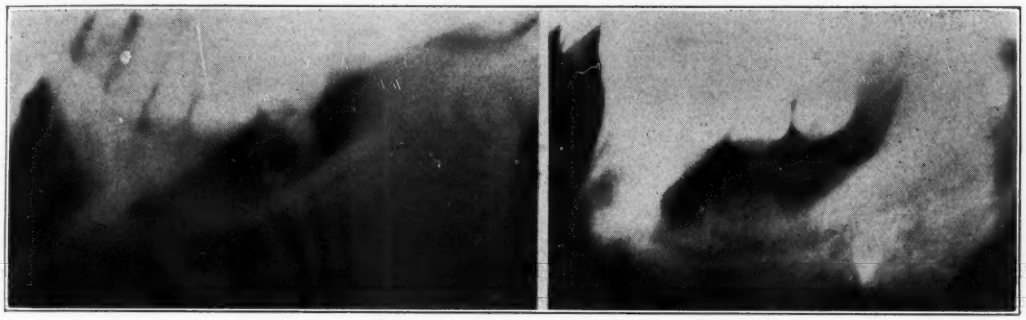

Fig. 1. Fig. 2.

Fig. 1.—Extraoral roentgenogram showing periapical osteitis of mandibular second premolar and second molar in a case of acute cellulitis and beginning acute osteomyelitis. (Figs. 1-13, case of Miss B.)

Fig. 2. Extraoral roentgenogram two days after removal of mandibular second premolar and second molar. The soft tissues were incised for drainage, but the bone disease is shown to be progressing by a roughening of the lower border of the mandible.

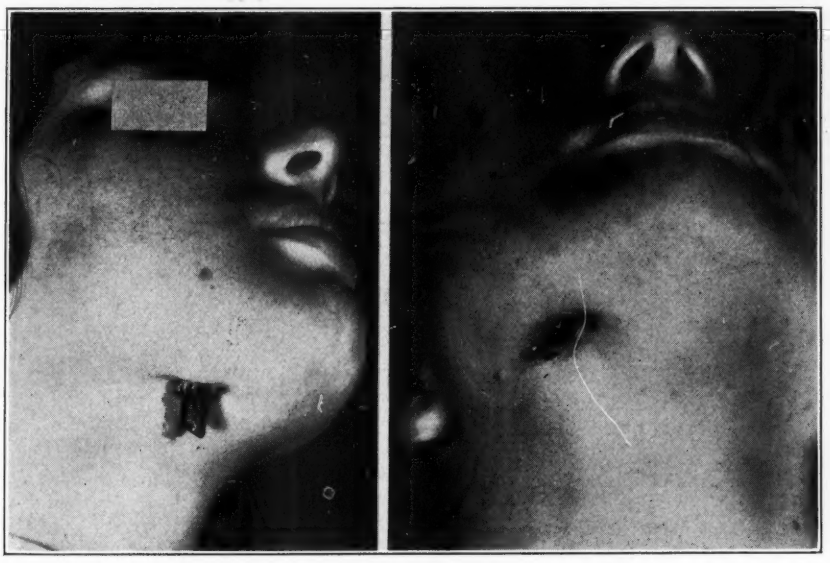

Fig. 3. Fig. 4.

Fig. 3.—Photograph showing incision and drain tube.
Fig. 4.—Photograph after removal of drain tube.

the bones; and septicemia. Osteomyelitis does not tend to recovery, but if neglected, usually becomes a chronic destructive suppurative process.

In treating osteomyelitis the evacuation of pus is necessary. This is done intraorally if possible, but it is necessary at times to make an incision on the outside of the face to establish what we term a through-and-through drainage. Where the disease has traveled up the ramus, it is often necessary to

make two incisions on the face, one above the parotid gland at the lower border of the zygoma, and the other at the angle of the jaw just below the lower border of the mandible. A fenestrated rubber tubing is passed through

Fig. 5. Fig. 6.

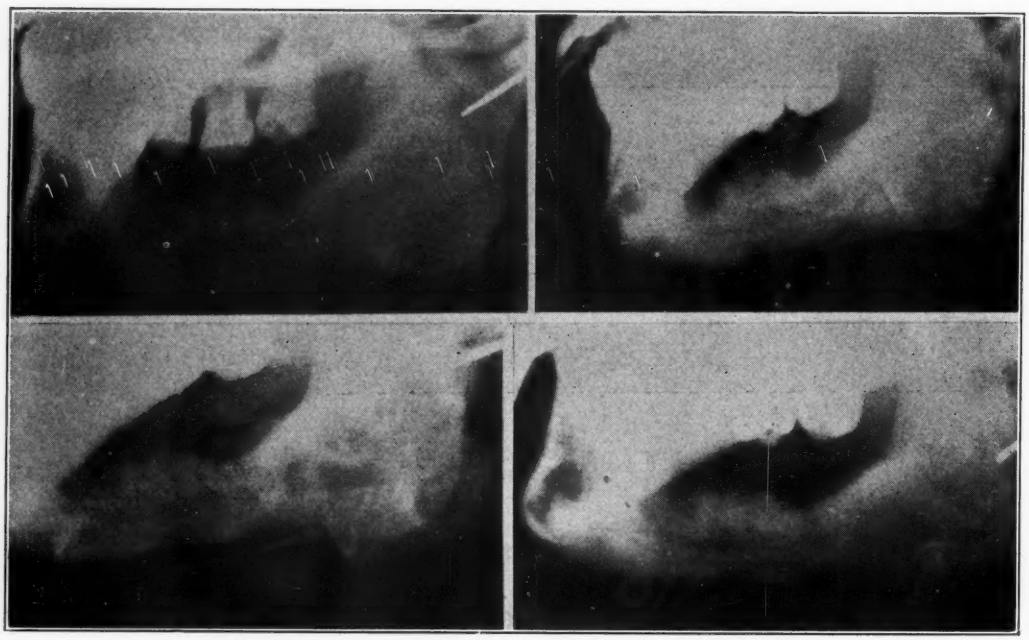

Fig. 7. Fig. 8.

Fig. 5.—Roentgenogram taken August 18 showing beginning sequestrum formation.
Fig. 6.—Roentgenogram taken September 19 showing sequestrum almost separated.
Fig. 7.—Roentgenogram showing separation of the sequestrum.
Fig. 8.—Roentgenogram taken immediately after removal of sequestrum through extraoral incision.

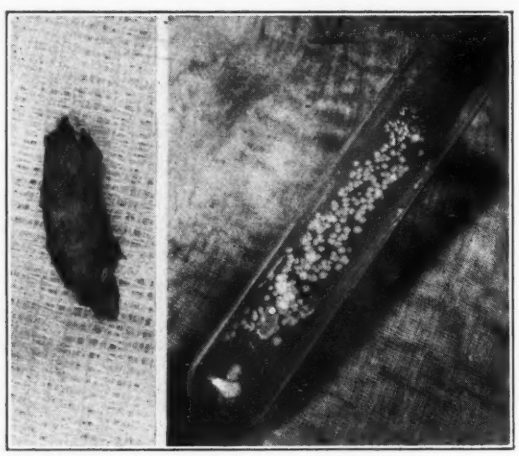

Fig. 9. Fig. 10.

Fig. 9.—Sequestrum removed.
Fig. 10.—Twenty-four-hour growth from osteomyelitis.

from one of these incisions to the other, following the bone closely. Safety pins are run through the outer ends of the tubing in order to keep the tubing from slipping or coming out. Gentle irrigation can be done through this tube

with a mild, nonirritating antiseptic, care being taken not to use any undue force in irrigation. The tube allows ample drainage of the pus. The exact time the tubing is left in depends upon the case, but when it is taken out the wound is packed with gauze until the sequestrum has formed and has been removed. The gauze is then changed daily, using a smaller piece each day, allowing the wound to heal from the inside out.

In making incisions for drainage it is best to do what is known as blunt dissection; that is, you first cut only through the skin and superficial fascia and use a pair of hemostatic forceps to push on through to the deeper tissues. In this way you run less danger of cutting any blood vessel, and by opening up the forceps after they have been pushed into the desired depth and turning them in different directions you open up a larger space for drainage without cutting the tissues in the infected area. The operator's forefinger may be used in some cases—where it is desired to spread the incision larger to explore deeper areas.

Fig. 11.—Photomicrograph of staphylococci obtained from culture.

The diseased bone must not be removed until the sequestrum has formed, and then at times it is left until new bone has formed acting as a splint or frame for the new bone. It is important to know when to remove the sequestrum after it has properly formed, and that depends upon the individual case.

When a patient presents himself or herself for treatment or where the osteomyelitis develops while you are treating a patient, it is well to remember that the patient's physical condition is going to control his recovery along with the surgical treatment. Osteomyelitis will occur at times regardless of the care you may take, and it usually is due to the patient's physical condition; therefore you need a blood picture with information as to the red cell count, leucocyte count, differential, hemoglobin, and clotting and bleeding time. A urinalysis should show the presence of albumin or sugar and also the results of calcium and phosphorus metabolism.

The patient should receive adequate rest, and be put upon a diet of liquids, fruit juices, such as orange and tomato, green vegetables of all description, cod liver oil, and tonics containing blood-building properties. It may be necessary to supply calcium and phosphorus. The amount of sweets and acid-forming foods should be limited.

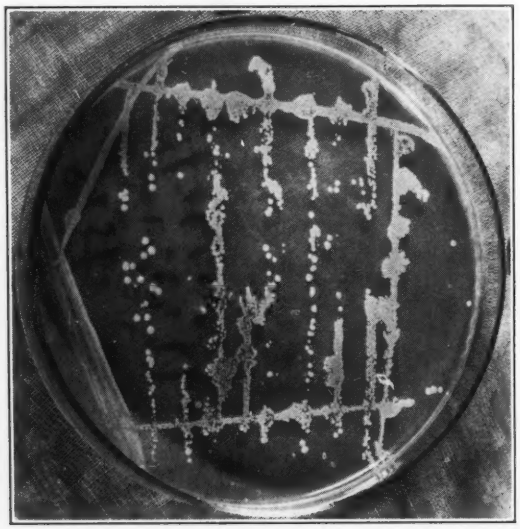

Fig. 12.—Forty-eight-hour growth of culture taken from osteomyelitis case.

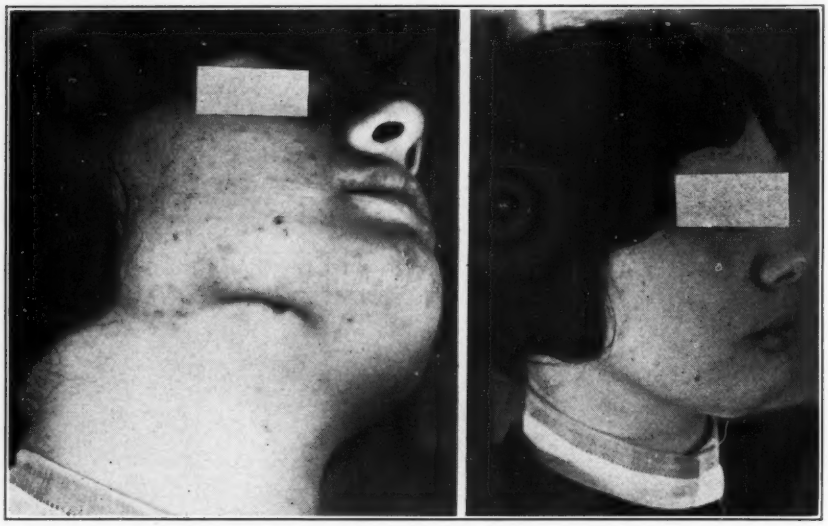

Fig. 13.—Photograph after healing of wound.

CASE REPORT

Miss B. presented at the Georgetown School, August 5, 1931, for the removal of a right mandibular first molar which was slightly sore. This was removed under nitrous oxide. She returned the following day with swelling. On August 8 she was brought to me with a definite cellulitis. I ordered her to enter hospital. I made an incision under the jaw and placed a drain

tube. This drain tube was removed the following day, the wound irrigated, and the tube put back and left out on the third day.

An osteomyelitis developed. She was immediately given calcium and phosphorus, plenty of orange juice was added to her diet, and an alkalinized heavy diet was prescribed for her. She was given a hot saline mouth wash, and the drainage was kept up in the soft tissue by occasional use of magnesium sulphate hot packs.

The first picture, taken August 8 (Fig. 1), shows a beginning osteomyelitis with a slight break in the periosteum along the lower border of the mandible in the premolar region.

The extraoral picture, taken August 14 (Fig. 2), shows the extension of the periosteitis and the osteomyelitis into the body of the mandible and beginning sequestration of the bone along the lower border.

The picture taken August 24 shows a definite sequestration of the bone.

The picture taken September 3 shows the bone completely sloughed.

The picture taken September 6 was made immediately after one of the

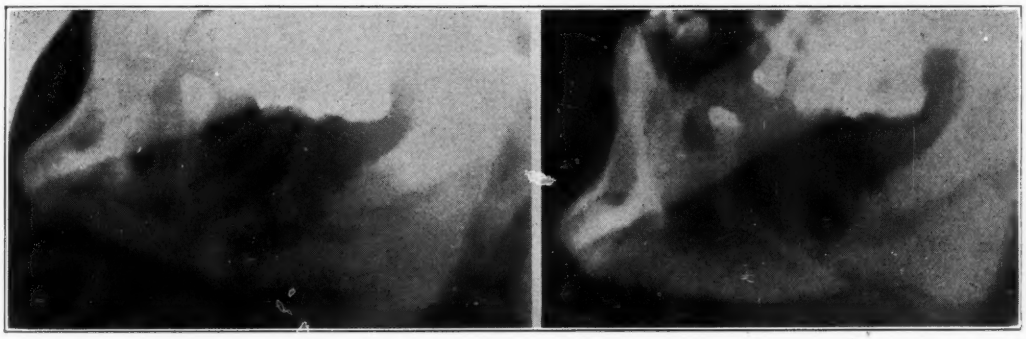

Fig. 14. Fig. 15.

Fig. 14.—Case of Mr. A. C. Showing sequestrum of case which was operated upon intraorally.

Fig. 15.—Showing same case as in Fig. 14, after sequestrum was removed. Note the near pathologic fracture. This patient recovered uneventfully after drainage in mouth was established and sequestrum was removed.

sequestrums had been removed through the incision along the lower border of the mandible made for the drainage of the soft tissues during the time of the cellulitis.

The picture taken September 18 was made immediately after removal of the second sequestrum and showed the bone in a regenerative condition.

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DISCUSSION

Prescott LeBreton, M.D., St. Petersburg, Florida.—This paper by Dr. Thompson covers the subject very completely. As my experience is with osteomyelitis in various parts of the body, in addition to the jaw, I shall speak from that viewpoint. The disease is often rec-

ognized too late, far too late from the patient's standpoint. It is a very serious affection, and often leads to distressing deformity; in fact some of the worst disfigurations I have seen have been due to prolonged drainage from the jaw. The diagnosis in the early case rests on the swelling, extreme tenderness, and white blood count, and not on the x-ray picture. Later on, the x-ray examination is of great value in deciding what steps to take to clear up the infection. Just as in osteomyelitis of other parts of the body, early drainage, usually without removal of the tooth, is imperative, but as a rule, the pus continues until Nature has established a protective wall, some dead bone has formed, and a cleaning up operation is indicated with removal of part of the roof or outer wall, cleansing of the cavity, and the vaseline pack. The use of maggots, valuable in the cases in other parts of the body, can be substituted, I understand, if there is no opening into the mouth. Any dentist who has not had much experience in dealing with these cases, should have consultation, or else refer his case direct to a surgeon dentist who is both bold and skillful. Relatives should be informed of the seriousness of the disease, and the patient should be hospitalized early. As the infection can spread so rapidly, the patient must be seen at frequent intervals until it is evident that the inflammation is quieting down.

ELEVATING A SUBMERGED DECIDUOUS MOLAR*

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A CASE of neutroclusion with submerged mandibular left second deciduous molar, with a distal migration of the mandibular left deciduous canine and first deciduous molar. The patient was a boy eight years of age. X-ray examination showed the permanent successor present. The submerged tooth could have been extracted and a space retainer placed, but the incorrect relation of the left deciduous canines, deciduous molars, and also the first permanent molars did not warrant extraction with the consequent long wearing of a retainer.

The object of treatment was to establish normal functional relation of the maxillary and mandibular teeth of the left side, and if possible to elevate the mandibular second deciduous molar.

A mandibular 0.040 labial arch was placed November, 1929.

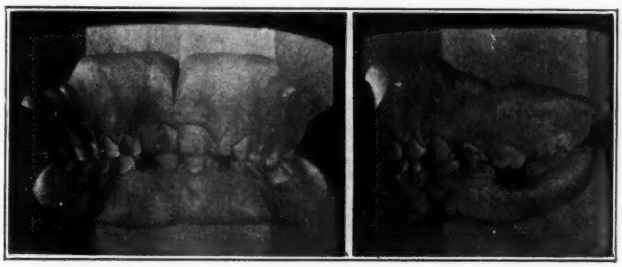

Fig. 1. Fig. 2.

Fig. 1.—Front view at start.

Fig. 2.—Left side, notice distal relation of canines and first deciduous molars, space between maxillary first permanent molar and second deciduous molar. The tip of buccal cusp of mandibular second deciduous molar is just showing.

The left canine and first deciduous molar were ligated with a long loop ligature to a spur on the arch, forward to the canine. This appliance was worn seven months.

The space opened quite nicely by June, 1930, at which time the patient was going away for two and a half months.

The appliance was then changed to a lingual arch with a band and half round tube on the left first deciduous molar, vertical round tube on the right first permanent molar and half round tube on the left molar.

The lingual arch was 0.040 from right molar to left first deciduous molar, and 0.025 from left first deciduous molar to permanent molar.

The light wire section was adjusted to open the space, and the vertical round tube on the right allowed free movement or rotation of the arch as the canine and deciduous molar came forward.

An auxiliary spring was placed against the right canine for slight expansion.

When the patient returned, the maxillary lateral incisors were erupting lingually, and the deciduous lateral incisors, still in place, had to be extracted.

*Read before the New York Society of Orthodontists, March 14, 1933.

Fig. 3.—After eighteen months of treatment when all appliances were removed. The maxillary first permanent molar did not drift forward during six months of observation.

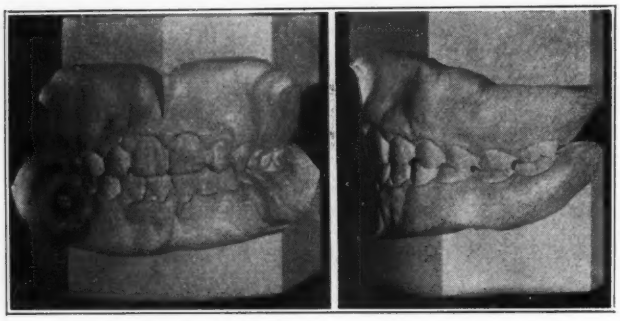

Fig. 4. Fig. 5.

Figs. 4 and 5.—After the final application of appliances.

Fig. 6.—Showing the change in the occlusal plane, with the second deciduous molar elevated into occlusion.

A maxillary labial arch with bands on first permanent molars was placed in October, 1930.

There was a hook for intermaxillary elastics on the left side. The mandibular left first deciduous molar band was removed and a buccal extension soldered to it distally.

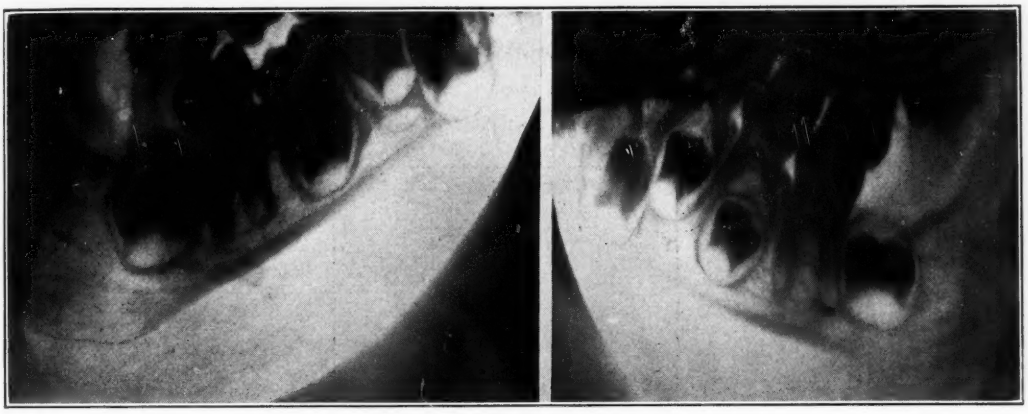

Fig. 7. Fig. 8.

Fig. 7.—Extraoral x-ray picture of left side; note space between occlusal surfaces of second deciduous molars.

Fig. 8.—Extraoral x-ray picture of normal right side.

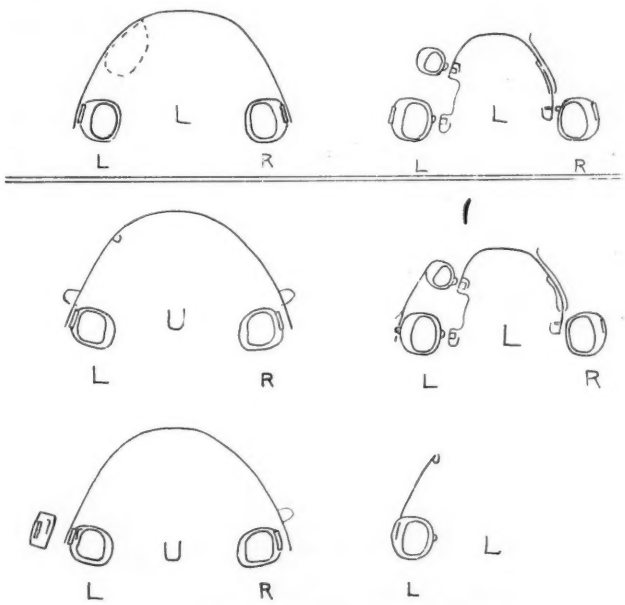

Fig. 9.—Sketch of appliances employed.

The extension carried a hook and fitted loosely in an eyelet added to the permanent molar band. This provided a long front-to-back pull of the elastics and increased the resistance to the elevating and tipping forces on the first deciduous molar.

As the space increased the submerged deciduous tooth came occlusally, without any force on it.

By March, 1931, the bite was opening so the intermaxillary elastics to the extension were discontinued and attached to an overlay cemented to the second deciduous molar. This provided active elevating force and caused no additional opening of the bite.

June, 1931, all appliances were removed.

The mesiodistal relation of the left first permanent molars was not correct. There was a space between the maxillary permanent and second deciduous molars; it was thought that nature would make the desired adjustment.

Six months later January, 1932, the maxillary lateral incisors had dropped back some and the molar relation had not improved.

Fig. 10.—Intraoral x-ray picture, January, 1933.

The maxillary labial arch was replaced.

Provision was made for intermaxillary elastics between the mesial of the left maxillary first permanent molar and a hook on a buccal extension forward soldered to the mandibular molar band.

Some elevating force was exerted on the second deciduous molar by ligating the extension to it. Elastics were worn intermittently until May, 1932, when all appliances were removed and impressions taken.

An intraoral x-ray picture taken January, 1933, shows the second deciduous molar in place; apparently normal absorption of its roots and normal eruption of the successor are taking place.

DEPARTMENT OF
DENTISTRY FOR CHILDREN

HOW DENTAL HEALTH MAY BE TAUGHT IN THE PUBLIC SCHOOLS*

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Director of Elementary Education in Public Schools of Elizabeth

IT IS encouraging to note the degree to which dentists and public school administrators are cooperating in order to make education in dental health more effective. In the past, emphasis in dental health has been placed on certain phases of dental health which lend themselves to dramatic action—notably brushing the teeth. Dentists and school officials are beginning to realize that there is a body of dental knowledge and habits necessary for the good health of the school child, that the teacher is the fulcral point in the dissemination of this knowledge and in the development of these habits and attitudes, and that there are optimum methods of presentation of such material to the child. My paper will deal with the latter phase.

The dentist must realize that dental health is but a part of the great mass of educational stimuli to which the child is subjected in order that he may better understand his immediate environment and be prepared to meet future problems.

The school administrators must realize that dental health is an integral part of the health program and as such must be given such emphasis as may be determined necessary for the habituation of desirable health habits.

The objectives stated in a typical course of study indicate the degree to which that school system is conscious of the need for dental health. They are as follows:

1. To get all children to eat foods which will build sound teeth.
2. To get all mouths free from decayed, abscessed or stained teeth.
3. To have all children brush their teeth with their own toothbrushes.

You can see that to this might well be added the attitude toward the dentist, the habit of watching their own teeth, the attitude toward deciduous teeth, the understanding of the place of teeth in the physiology of the body, and the skill in caring for teeth. Safety in protecting the teeth is often neglected.

The cardinal principles of education indicated that health was the first objective in education. The White House Conference gathered the opinions of more than two thousand prominent professional people in an effort to place health foremost in the educational program. State and national dental associa-

*Reprinted from the N. J. State Dental Journal, June, 1933.

tions have educational committees, the major purpose of which is to assist educational agencies in keeping up with modern trends in dentistry. However, in spite of all the emphasis which has been given to health, there is a tremendous lag in health practices as evidenced in school children. In the first place, with the necessity for teaching the children skill subjects, there has been very little time left to devote to this important phase of education. In the second place, there is a tendency on the part of curriculum makers to assume that health cannot help being taught.

If we are to bring health in the schools to a position indicated by the philosophy underlying education, we must reorganize our principles of education accordingly. Educational leaders are fairly uniform in their statement of objectives in health education. Dr. Nash, of the New York University, is very emphatic in his objections to making a child conscious of health rather than making health a matter of habitual performance.

The following statement is indicative of the objectives desired in health education:

"There are two main functions of the health program in the elementary school. 1. Insuring in school life, through health supervision, the essential protection of child growth and development. 2. Providing through school channels educational guidance which will help the child develop behavior essential to daily healthful living in the home, school and community, and to assist him to become intelligently self-directive in matters of healthful living."

The realization of these objectives is a tremendous task. It is usually agreed that the final objective is that "children may live healthfully and carry over into adult life habits, attitudes and skills which will function adequately."

The divisions of health and physical education of the State Department of Education in New Jersey have listed certain principles underlying methods in health education in a pamphlet "Standards in Health and Safety."

1. Teacher example.
2. Habitual practice rather than information.
3. Habits should be strengthened by development of attitudes favorable to continued practice.
4. Opportunity for satisfaction in repeated practice.
5. Each habit or attitude established as a separate objective.
6. Life experiences as teaching situations.
7. Methods should produce wholesome mental reactions.
8. Methods should stimulate desire of pupil to know more.
9. Predominant interests of pupil one factor in selection of method.
10. Method chosen from pupil's viewpoint.
11. Positive rather than negative.
12. Provide practical experiences through school situations and experiences.
13. Should be made interesting to pupil (interest vs. amusement).
14. Should correlate with other subjects.

The development of practical methods and devices to meet these principles will do much to increase the effectiveness of the health education program.

The setting up of methods and devices in dental health should be based on the psychology of learning. Abstract ideas are very difficult for children under twelve years of age. If you were to ask a child, "What is health?" he would be very apt to reply, "Health is to open a window," or "Health is to clean your teeth." It is possible to use basic principles of human nature such as appeals to avoidance of pain and danger, self-assertion (getting beautiful teeth), and rivalry. This latter becomes exceedingly dangerous as a method unless it is based on equal opportunity in each individual case. We can also utilize the basic instincts and emotions of children. We can adhere to scientific principles of habit formation in utilizing the laws of learning—readiness, exercise and effect.

It is hardly within the scope of this paper to do more than indicate the details of the "how" of teaching dental health. I am submitting a chart of factors which lead to the setting up of teaching methods and devices in health education, and I should like to discuss for a few minutes some of the implications of these factors for dental health.

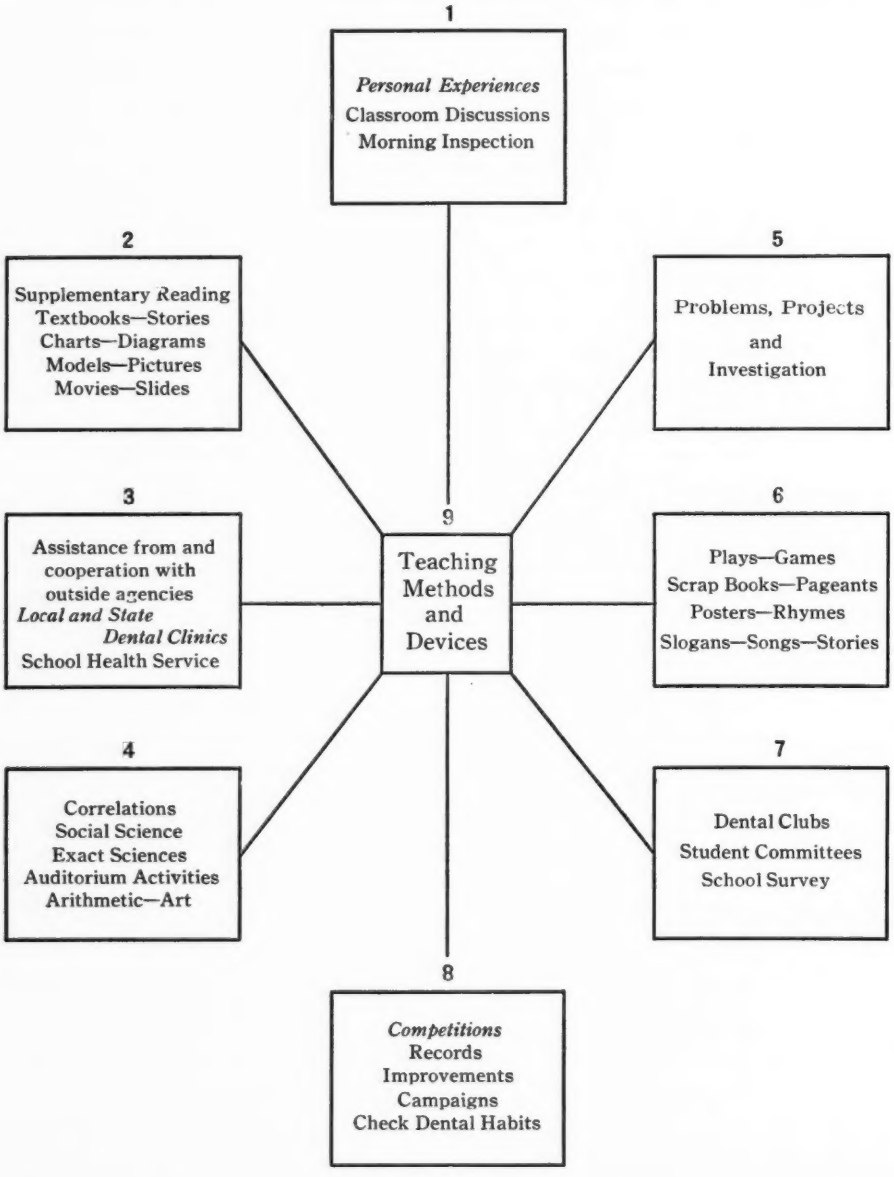
1. (a) Personal Experiences—Visits to the dentist, x-ray pictures of own teeth, visits to health centers, recipes developed in the home.
   (b) Daily Inspection—Comparison of appearance of teeth, use of mirror to see the inside of the teeth.
   (c) Classroom Discussion—Facts from daily inspection, charts and pictures of teeth, facts from personal experiences.
2. (a) Supplementary Reading—Vocabulary, interest stories, health chores to tie up with individual record keeping (Ellis Parker Butler in his story of "The One Armed Boy").
   (b) Textbooks—Development from the facts of physiology often lacks motivating interest, is restrictive in scope to the course of study, and usually represents a single viewpoint either dental or educational. Does not always include latest development in dentistry.
   (c) Models—Food, dissected teeth, opportunity to use clay, demonstration of taking impressions of teeth, sculptures showing effect of appearance of defective teeth.
   (d) Charts, Diagrams, Pictures—Should be made by the children, should be simple with very few details, should be posted and changed frequently, should be artistically sound.
   (e) Movies and Slides—Slides have more interest but no more educational value than charts and diagrams. A discussion of movies will be taken up later in the paper; visual education includes posters, charts, diagrams, slides, movies, pictures, examination of life figures.
3. (a) Dental Clinics—Talks by school dentist and nurse. Dental news bulletins, demonstration of tools of dentistry to children.
   (b) Health Service—Mimeographed health bulletins including dental factors.
   (c) Other Agencies—Commercial organizations, such as milk companies, mouth wash and tooth paste companies, present a danger

of exaggeration and untruth; local organizations, such as your own committee and the nutrition class of the school or the hospital present an opportunity for objective teaching.

4. Correlations are the backbone of the dental health programs, because without them practically no time would be given to dental health.

   IN SCIENCE—Decay can be shown through vegetables and the application made to teeth, germs can be developed and the application made.

CHART OF ELEMENTS LEADING TO THE SETTING UP OF TEACHING METHODS AND DEVICES IN HEALTH EDUCATION



Adapted from diagram printed on page 9 of the Salt Lake City Public Schools Course of Study in Health Instruction for the elementary schools.

In Social Science—The history of professional progress should include dentistry.

In Geography—The effect of climate can be shown.

In Nature Study—The teeth of various animals can be shown to accomplish various purposes.

In Domestic Science—The composition of foods can be shown in relation to teeth building.

In Arithmetic—Cost figures showing the cost of the right kind of food as compared to the cost of dental care can be shown. Interest can be aroused through including cost of amusement or toys as compared with cost of caring for teeth.

In English—Letters can be written to various firms for samples of material to be studied in the class and exhibits may be presented.

In Art—The whole range of visual education can be accomplished.

5. (a) Class Projects—Writing a pupil textbook in dental health. Developing a toothbrush technic. Planning Thanksgiving and Christmas baskets to determine food needs. Planning a store with desirable food elements.

   (b) Investigation and Experimentation—Determine the correct type of toothbrushes and cleaners. Watching the effect of various types of feeding on pets. Investigation of the extent of teeth defects among the children in the class. Experimentation with growth of bacteria.

6. (a) Dramatization—The material should be concrete before twelve years of age and may be abstract after that.

   (b) Games—Dental drills, family problems.

   (c) Booklets and Scrapbooks—Should be made by children, because printed booklets may be learned but there is no practice in habituation. Scrapbooks must be individual and represent child's own work.

   (d) Pageants—Take too much time and preparation. Do not include enough pupil participation, and tend to be inaccurate.

   (e) Rhymes and Slogans—Good instructional material if changed frequently.

   (f) Songs—Should not be aimless rhymes or jingles. Should meet specific purposes and situations.

   (g) Stories—Utilization of creative ability of children. Utilization of facts of epidemics, such as, the trench mouth.

7. (a) Dental Clubs—Tend to become stereotyped and attendance becomes involuntary; after the first organization they are not pupil motivated. Better to disband club than have lack of interest.

   (b) Student Committees—Only for specific and immediate purposes.

   (c) School Survey—Number and kinds of defective teeth, advisability of clinics and evaluation of improvement and progress of children.

8. (a) TESTING—Should be for teaching purposes and never for marking.
   (b) RECORD KEEPING—Does not guarantee performance; there is danger of falsifying; injustice through requiring the impossible, such as, poor teeth compared with good teeth; and forgetting.
   (c) DENTAL HABITS—Should be evaluated periodically through the observation of the teacher and parent, and through the report of the school dentist.
9. Teaching methods and devices depend to a large degree upon the type of child and the home background brought to the learning situation. Demonstration of cleaning teeth and the work of the dentist, conversation about personal experiences with the teeth, commendation for superior work, exhibits of work done in the class, progress and achievement charts, all play a part in the teaching process. No teaching device is effective unless it carries with it the purpose on the part of a child to learn. The newer schools with their activity programs facilitate the integration of all learning which is a desirable step toward better health teaching.

In order to get some indication of the effectiveness of moving pictures as an educational device, two dental films, "Care of the Teeth" and "How Teeth Are Built," were shown to 5,000 fourth, fifth and sixth grade children in the public schools. Six weeks later a recall test, devised by the author and Dr. J. M. Wisan, Chairman of the Council on Mouth Hygiene of The New Jersey State Dental Society, was given to a random sampling of 419 pupils who saw the film. The same test was given to 261 pupils in another system who had not seen the films and who presumably had the same general instruction in dental health. The results, in terms of the amount of recall of these particular films, indicate that there was no significant difference in the amount of recall of those who had seen the films. Further research on this problem with the teacher, curriculum, and time schedule factors held constant, is indicated as necessary.

In general, questions about the structure and location of the teeth made a very slight impression on the pupils. It may be that questions as to the location of the teeth or as to the different parts of the tooth have no educational value in terms of health habits. Certainly they are more difficult to teach in terms of visual education. This is especially significant in view of the fact that the films attempted to make these factors interesting through animated cartoons.

Each question in the test was ranked from one to five on a basis of the percentage of pupils who answered the question incorrectly. Abstract questions relating to food, decay and disease were correctly answered by most of the pupils and ranked one. Questions relating to diseased teeth, how teeth are attached, when permanent teeth are formed, the best foods for growth and exercise, the source of blood supply, and the outside covering of the tooth, ranked two. Questions relating to dental defects, thumb-sucking, chewing, toothaches, the location of nerve and blood supply, the location of the grinding teeth, and the importance of the first permanent molar, ranked three.

Questions relating to the best time for brushing the teeth, the importance of the dentist in tooth protection, the first permanent tooth to appear, the location of the parts of the teeth, and the age of acquisition of permanent teeth, ranked four. Questions relating to the number of deciduous teeth and the location of the deciduous and permanent teeth, ranked five.

Grade four showed consistently poorer results than grades five and six. There was very little difference in the results as between grades five and six.

This study has indicated that the factual and objective data taught through these films had very little effect on the increase in dental knowledge on the part of the children taking the test. While the results are in no sense conclusive, they have shown a need for scientific determination of: first, the effectiveness of indiscriminate showing of moving pictures in dental health; second, the type of instruction which best lends itself to visual instruction; and third, the kind of facts that should be taught in dental health.

I hope that I have shown the tremendous problem in setting up an adequate scheme of caring for dental health in the curriculum. Certainly, there is great need for experimentation to determine the comparative merits of such methods as the poster, the movie, the informal talk, the class discussion, the socialized recitation, the textbook, etc.

When it is further realized that dental health represents but a very small part of the total educational program, it will be seen that if this program is to be satisfactory, the most economical and efficient methods must be adopted. We, in education, realize the tremendous value of the dental association in initiating such experimentation. We hope that the dentists, too, realize the necessity of expert educational advice in order that the program may be set up in terms of the general educational scheme.

The ultimate success of any program in the public schools, however, is dependent upon the degree to which the public will support the ideas embodied therein. Through the unselfish efforts of the dental profession such support can more easily be obtained.

MOUTH HEALTH EDUCATION PROGRAM IN GEORGIA*

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PEOPLE are benefited only when they are informed." When I read that statement, I thought that is why we have a mouth health education program in Georgia. Who are the people? Who are to be benefited? How are they to be informed?

George Washington once said, "I have little sympathy for those who tread the ruts their fathers trod." In the ruts our fathers trod only a small group of people received the benefits from the dental profession. Emerson said, "Be ye openers of doors for others." What a challenge, what an opportunity, what a responsibility, when we think of the part that the dental profession plays in opening the doors of health.

In January, 1932, a new dental program was organized in the State Board of Health. The activities of this department are education and organization. Since this was to be an educational project, some one from the school ranks was chosen to supervise.

All health work must progress on a cooperative basis. To establish a dental program involves the bringing together of two groups: the school and the home, with the dental and health authorities. The home and the school are the people to be informed. Both groups are to be benefited. The home means parents and children, the school means teachers and children. It is logical that we should attempt to reach the home first. A group of educators met to establish an organization for child welfare. Theré was a physician among them, a dentist, a psychologist, a nutritionist, and others. The question was asked of each specialist, "What can you contribute?" The dentist told the important rôle he was to play, the physician said that he was to look after the general health, the nutritionist argued that diet was the basis of health, the psychologist was to consider the psychologic development. Finally a little woman was asked, "What can you do?" She said, "I shall look after the child. I am the mother."

Educators have come to realize that mental education without health and health education is of transient value. A college president was asked to tell what he thought children should get out of school life. He said, "First of all I want my child to have health, to appreciate its value, to have a determination to maintain it for himself and promote health for others." As for the child, a little boy said:

> "My daddy said that God is just as big as he can be,
> So he can't get any bigger, and it seems so queer to me,
> That though I'm just a little boy and can't do much you know,
> Yet I can do what God can't do. I can grow and grow and grow."

It is our responsibility to foster and guide that growth.

*Read before the Georgia Dental Association, Savannah, June 11, 1933.

To acquaint parents, teachers, and children with the mouth health program and to secure their cooperation, is our first objective. The groups which we must bring together are agreed upon the importance of health in education and education in health. Now we need leadership plus cooperation: leadership, to show the need for mouth hygiene and to build a program upon the right principles; and cooperation to bring together all agencies organized for child welfare.

We recognize as our next objective: *To reach preschool children through child health conferences and parent education.* All reforms must begin as early as possible in the life of children, perhaps all reforms must begin with parents. Surely any reform concerning mouth health must begin with parents. The supervisor has been asked to meet with the officers and to be a member of the board of the Georgia Council of Parents and Teachers. A hopeful aspect of the work is the fact that as soon as parents are made to appreciate the importance of oral health, their cooperation is assured. We hope to expand our program in parent education. It is our aim to reach the child and not just the school child, for to begin with the school child is to start late.

Our third objective is: *To improve the standard of teaching dental health education in the schools.* The public is best approached through schools and kindergartens. To go into the schools and examine mouths, send notices to parents, fix teeth, is one thing; to have this program incorporated as a regular part of the school work is quite another. Our plan advocates the establishment of dental education as a part of the regular school health program. It is not intended to be a one-year dental campaign. The teacher is the best agent through which we reach the child because she is trained to deal with children, she understands the mental ability of children of different ages, she enjoys a close relationship with the children, she has daily contact, she is in touch with the modern trends and methods of teaching health education. The teacher is the pivot around which the school program revolves. The progressive teachers have grasped the enormous possibility of the schoolroom as a place where health habits can be inculcated as firmly as the alphabet and multiplication tables. The teacher is the link between the child and the things that dentists want that child to know, and the child is the link between an uninformed public and an informed public.

The major part of our work this year has been with teachers. We have tried to show the problem at hand and give to them a definite plan to follow. May I tell you how we have tried to do this. We must first approach the school superintendent, city or county, for he is the key person where school work is concerned. We have attempted to build a program which we believe the superintendent can accept with confidence. If he is interested, arrangements are made to meet the teachers in a group. At this conference we attempt to show the teacher: The need for mouth hygiene, better mouth health means better general health, better general health means a better school, mouth hygiene must be a part of health education, and health education must be a part of general education. With few exceptions I get the question, "What can we do?" They are willing but in many instances they have not

the knowledge. I leave with each teacher an outline which is furnished by our department. It is just what it is called, "Suggestions for Teachers." It is an attempt to give an outline which dentists will accept as scientifically true, and which the teachers will accept as educationally sound. How are they to be informed? The teacher must know the principles of mouth hygiene; she must interest the child, and the parent becomes curious about the child's enthusiasm and wants to know more about it. If the parent of this child refuses to be informed, we have informed the parent of the next generation. Thousands of grown-ups wish that schools had had this particular enthusiasm twenty years ago. During the past school year I have been able to meet about 2,000 teachers in conferences, and about 2,500 are using the outlines. I believe this means more for the cause than talking to the 35,000 children in the thirty-seven counties in which I have worked.

Dental health must expand and become more and more closely integrated with the whole child program. Nurses of all kinds as well as dental hygienists, welfare departments distributing food as well as health departments, agricultural extension workers, county demonstration agents as well as nutritionists, all must recognize the problem and combine their efforts. People must be encouraged to plant tomatoes and tooth-building foods before they can feed them to children.

We must be more consistent in our living and in the examples which we as individuals and as schools set for children. A school cannot teach proper diet and sell candy at a penny a stick just one hour before we send children home for the noonday meal and expect them to eat turnip greens and drink milk. Remember,

> "It is easy enough to establish the rule
> By which other people should go,
> But the test of a man and the proof of his creed
> Is not the advice that he gives
> Nor the wisdom he utters to others in need
> But solely the way that he lives."

To have every child examined each year is our fourth objective. This examination plays an important part. Best results are obtained when this examination is prepared for and followed up by the school. There are several reasons for this. If it is to be a part of school work, this examination can be an educational procedure for child and teacher. The child is more interested in mouth hygiene when you go to the school or he comes to you than at any other time. The teacher should follow the examination of each child so that she may know the individual problem. If the school invites you to come in to make an examination and the school does the follow-up work, there can be no criticism in the community that this is a program initiated by the dentists to make money. Dentists object to this criticism and it hinders the program. We furnish a uniform blank which we hope will show the need as well as the trend of results.

To have every school sponsor a plan for dental corrections, encouraging children to enter school each year with a dental certificate. Every school presents its own problems which only those working in that school can meet.

Corrective work should be the duty of the home. This is to be education, and through the school we expect the child to learn that the principles of mouth hygiene are: diet, exercise, cleanliness, and dental care, and we want the child to form the habit of observing these principles. We want to teach these children to use intelligently the health services of the community rather than to expect health from the community. If we encourage a program which gives free dental care to many children, we are defeating the purpose of education. We always have to recognize three groups in every school: those who can, those who won't, those who cannot. For those who can have dental work and will go to the family dentist just as soon as attention is called to the fact that they need to go we furnish follow-up letters to be sent out by the school; for those who won't go to the dentist, we must depend upon the teacher to discover the reason and influence the person at fault, either parent or child. And for those who cannot afford dental work, here again it is the school that knows. We urge every teacher to begin her program with those children who can go to the family dentist and decrease the number each year in the last group rather than increase. If by corrective work we improve the mouth health of the children of today and if by educational work we improve the children of tomorrow, our program will justify the effort.

Our program is just in the making. We believe the educational efforts expended should lay the corner stone for something of a permanent nature. It is our aim to evolve a program that will raise the standard of intelligence concerning the dangers of mouth infection, the necessity for its removal and the value and economy of prevention.

Dentists can best interpret their profession to this uninformed public by giving children mouth health education. This is an investment with good returns.

Do you remember the story of the Indian chief about to pass on to the "Happy Hunting Grounds," and he could not decide who should succeed him as chief of the tribe? He selected his four leading warriors and sent them on an endurance test up the slope of a mountain, and asked each to bring back some evidence of his journey. The first brought back a leaf from the last tree of the hillside. The second went beyond the trees where only moss grew and brought back a sample of that to show the height of his climb. The third went past the trees and the moss to the flint rock, from which he brought back a spark of fire. The fourth went to the very top of the mountain. He reported nothing of what he had passed, but told of a vision of fresh green fields in the plains beyond the mountain. He came back with nothing in his hands, but a vision in his mind. Breathlessly he said, "O Chief, our tribe must move over beyond the mountain." Needless to say the man who brought back a vision was chosen to lead the tribe. We are lacking in vision in the dental profession when we fail to give to children mouth health education.

Do we need a better creed or a greater challenge? We have a program, let's work a program. Appreciation is based on knowledge. "People are benefited only when they are informed."

CORRELATING DENTAL HEALTH INSTRUCTION WITH THE MODERN PUBLIC SCHOOL PROGRAM

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THE importance of dental health instruction in connection with the modern public school program is becoming more generally recognized as a necessary factor in the education of our girls and boys. The increase of personal efficiency through proper attention given to matters of dental health is being demonstrated. Educators are acknowledging this by inviting cooperation from the dental profession so that a program may be evolved to fit into the curriculum of present-day methods.

Primarily the public school is an educational institution. Its methods are a study of the processes of life. All activities used in connection with its functioning must be constructive in order to help the child develop his highest possibilities. Our normal and college training schools have produced methods that are peculiarly fitted to reach the minds of the present generation. The subject of dental health must be developed in a way to correlate with these modern ideas of instruction as evolved by these special schools.

Here and there all over the land attempts have been made to bring this important study into the school curriculum. Some very commendable plans have been produced, but on the whole there has not yet been discovered a course of definite action which is acceptable to the dental profession and applicable to the public school program.

There is great need for an activity to create an efficient dental health program that shall bring to the school age the benefits which the science of dentistry has for the mental progress and physical development of the growing youth. Who is to do this, and how it is to be done, are questions to be answered by those who are interested in the problem and competent to judge. In a public school system it is the teacher who is the largest and most important influence, for it is the teacher who has the vital contact with the child. It is the teacher who is responsible for the unfoldment of processes that unite to produce growth and progress in the mental and physical development of the pupil. Then it would seem that the teacher is the one to take charge of this all important part of the child's education.

But the teacher is not in possession of the facts that are essential to the presentation of this subject. The teacher is especially trained for efficient service in all other modern educational curricular activities. The subject of dental health has not been included in this training. Then there is only one conclusion to draw, and that is that definite steps need to be taken to have the

*Read before the Missouri State Dental Association.

subject of dental health education included in the subjects taught in our training schools for teachers. In view of the value which dental knowledge would add to the child's education, every teacher in training should be required to include the subject of dental health in her study so that she may be able to carry on instruction in this subject under supervision, for it seems to me that the subject is of sufficient importance to provide for a supervisor of dental health activity in every school system. This supervisor should be a dentist who has been trained in modern normal school methods so that he may be able intelligently to direct the well-trained teacher in this special branch of her work.

Just here we need to consider that dentists as a rule have little grasp of the teachers' problems and of modern public school methods. Then how is the correlation of dental health and child training to be brought about? Logical conclusions to be drawn would be that dental health instruction is needed in the schools for its value as an essential part in the child's education; that teachers in the public schools need special training to fit them to include this subject in their teaching; that training schools for teachers should include this as a special branch in their regular course in training; that supervision of dental health by dentists especially trained in methods of modern education is needed for the proper presentation of the subject; that some opportunity for instruction in training methods of the normal schools be included in the program of our dental colleges so that those who might elect to fit themselves for this important service could do so.

After twelve years of various methods of instruction in dental health matters in public schools, I have arrived at some conclusions which I hope will be helpful to others who are trying to solve this same problem of getting the benefits of this instruction to the pupil through the teacher. For convenience I shall present my ideas under two heads, viz.; "The Toothbrush Why and How" and "Building Sound Teeth."

THE TOOTHBRUSH—WHY AND HOW

In teaching mouth cleanliness we can appeal to the pupil's imagination much more effectively through the positive, the pleasant, and the ideal, than through the negative, the disagreeable, and the destructive. Pain, decay, untoward and unhealthy mouth conditions may have to be mentioned in connection with the subject of dental health, but they should not be brought into consideration in a way to defeat the purpose of the instruction.

Cleanliness is the keynote to the situation and should be so pleasantly stressed to the pupil's imagination that it unconsciously becomes to him a matter-of-fact barrier to anything that is not clean, a barrier so positive that habits of mouth cleanliness will be the natural and joyous outcome of dental health instruction.

Teaching the pupil to keep the doorway to the body clean should not be a hard or disagreeable task when one keeps in view the aim of the instruction, health, happiness, comfort, and usefulness. It is much easier to arrive at one's destination in the classroom by keeping constantly in view the goal of a

project, than by laboring with the disagreeable in the subject matter or worrying over the difficulties involved in the process.

When you select an object for the pupils' consideration, you would not choose a bug with a broken leg, a butterfly with a torn wing, an apple with a worm hole, a vase that is cracked, a toy that is bent, or an imperfect flower. Children know that such things are not normal. It would be no development to them to dwell upon the imperfections. It is the consideration of perfect models and perfect conditions that will unfold beauty, harmony, and mental activity in the child's consciousness. It is perfect patterns that are needed to develop creative ability and usefulness. Correct life pictures produce good thinking which results in desirable rewards for endeavor. Our appeal is for the teaching of cleanliness and perfection as a foundation for dental health.

The mouth is the threshold over which everything enters to build up and energize the body. To teach the pupil how to care for this threshold so that it becomes a barrier to repel all that will do the body harm, and a receiving station for preparation of all that will do the body good, should be a pleasant task and one that will leave a lasting benefit with the child.

Toothache, decay, infection, and diseases are not the main objects to be discussed. They are the bad things which we wish to prevent and destroy. Our object is to establish normal, pleasant, and healthful conditions. Then why dwell on the abnormal and imperfect when the normal and perfect are what we are trying to cultivate in the pupil's habits?

A reputable dentist is a factor for good in a community. His motto is "Art to conceal art." His vocation is a branch of science. His service for man is above the mechanical and mercenary. He is an artist having ever in mind countless models of perfect form, beauty, and utility. As he serves he keeps in mind perfect pictures of perfect conditions for the good of his patients and consequently for the good of the community at large. A perfect man, with a perfect mouth, in perfect health, is his model. He is ever the sculptor and artist using his chisel and mallet, and other mechanical devices only as means to the end that the clay upon which he works may assume the proportions of the correct model which he so intelligently and conscientiously endeavors to perfect. Then why speak of him and his legitimate life work before the child in a way to cause fear, or worry, or anxiety, or disagreeable pictures of the helpful and important service he is rendering for the good of the child for now and all time?

The dentist is the child's friend. It is a wise teacher who impresses this fact upon her pupil. It is not her province to dwell on dental imperfections. These imperfections are usually so self-evident that the child is aware of them. The pupil needs to know what perfect conditions are, and where, and why to obtain them. Here is the teacher's opportunity to hold the perfect model before the pupil by teaching him what constitutes a perfect mouth, in perfect condition. Of course the bad condition, the imperfection, must be corrected. The dentist will take care of that, and he will do it kindly. The chiselling, cutting, polishing, and finishing are his province. He needs the teacher's constructive work with the child to prepare him for pleasant anticipations of the dentist's service. In the classroom it is the teacher's province to hold up

the model of a perfect mouth, and to give information regarding perfect conditions necessary to establish dental health as a requisite to good scholarship, health of body, and alertness of mind.

When a child is normal, free from imperfections and suffering, when he is comfortable, he will be better able to grasp his educational opportunities. The pupil with perfect and hence comfortable teeth has a great advantage over the one with uncomfortable, unclean, and imperfect teeth.

Hold up the beauty, the usefulness, the promise of health from the possession of a clean mouth and sound, well-built teeth. Get him away from unpleasant and unclean pictures of conditions calling for dental service. Keep him busy hunting for and making pictures of perfect incisors, canines, premolars, and molars. Have him arrange them in order both above and below, being careful to note how the maxillary and mandibular teeth fit into each other in perfect occlusion. When the pupil knows which are the cutting, the tearing, the breaking, and the grinding teeth, and has the picture in his mind of how they should fit together and function, he should be better able to masticate his food intelligently, and he will have a greater pride in keeping his teeth clean and in a perfect condition.

Using standards of perfection from which to judge, the pupil will readily distinguish good teeth from bad ones, will know when a tooth needs attention, and when the conditions of the mouth are not normal. Thus he will acquire a proper attitude toward the care of his mouth and teeth and will be led to secure whatever service is necessary to establish dental health, whether it be prophylactic, remedial, reparative, or corrective treatment.

After the child's appreciation of dental health is awakened, remember that there is no permanent dental health condition all the time. This means frequent references to perfect models, keeping what is right about a clean mouth and sound teeth constantly before the pupil. We need to see that he keeps busy with his brush, paste, and wash, and with his trips to the dentist. The importance of a normal doorway to the body in connection with right physical conditions and good scholarship should never be allowed to fade from the pupil's interest.

We just mentioned something about paste and washes. The public school is no place to exploit the sale of a particular kind of tooth paste or mouth wash. There is plenty of opportunity and importunity in that direction, and it becomes quite a problem to the school employee. Complimentary samples of tooth cleansing preparations are very acceptable in connection with a public school educational program, but they must be dispersed in an inoffensive way and without commercial effort to produce sale. I never have had much patience with a large part of the "cure all" variety of literature that accompanies many of the tooth paste and mouth wash preparations that are on the market, although I value these products for what they are worth. They are cleansing agents, valuable as such, necessary to our self-respect and the olfactory comfort of those about us. All that we can teach the child about the toothbrush, and its helpers, is to use them to keep the mouth clean and free from odor, and the gums stimulated to healthy action. Let the child use what he likes best in the way of a reputable dentifrice. If there is some pathologic condition pres-

ent, he needs advice and should be referred to his dentist. The teacher's part in the matter is to help the pupil realize his need of clean mouth conditions and the resultant comfort and health benefits. Some constructive teaching method should be used to emphasize this clean and perfect ideal, without embarrassing the pupil by pointing out his imperfections, not forgetting the most important touch of all—the child's trips to his dentist. A clean, perfect doorway to the body—the child must not be allowed to get away from that.

To illustrate the point, consider a little lesson which I choose to name. "The Toothbrush Talks."

"You say there is nothing to me. Well, maybe that is true. I am only a brush and a little one at that. I am only a handle of bone with some bristle tufts at one end. But I am a good brush and I can do you a great deal of good.

"I am a happy brush for I have a legitimate way of helping you to add charm to your personal appearance.

"I am a useful brush, an important help to your health, comfort, happiness and beauty.

"I am your friend and benefactor, a cleaner of great import. I am an enemy to uncleanness, discomfort and ill health.

"I am a foe to what is filthy, diseased and abnormal. I am a friend to that which is natural, healthy, normal and physically good.

"I exercise a large part in helping you to establish respectability, comeliness, physical fitness and mental alertness. I am necessary to your well-being in many ways.

"I am a key to the door that guards the way to your body. Use me and you will profit. Neglect me and you will be the loser. Listen to my Clean Tooth Song. (Tune, *Marching Through Georgia.*)"

We have teeth so clean and white;
We're proud of them, you bet.
We brush them clean, and keep them bright,
We never do forget.
Toothache is an ill that none of us can ever get,
For we brush, brush, noon, night, and morning.

Chorus

Brush up, brush up,
On the lower teeth, we say,
Brush down, brush down,
For the uppers, that's the way.
In and out on the grinders' tops,
Our teeth are clean alway,
For we brush, brush, noon, night, and morning.

Brush them inside, outside, too.
On top, and underneath.
Then they always look like new,
Each row a pearly wreath.
We chew our food, oh, very fine
Because we have good teeth,
For we brush, brush, noon, night, and morning.

It is a privilege to teach girls and boys to be masters of their mouths, not to let their mouths master them. There is no need for pupils to have diseased and uncomfortable mouths if they are taught that their mouth, teeth, and gums are not masters but servants. Let them treat them as such and control them through cleanliness, and the results will be health and usefulness.

Help the pupil to see himself as others would see him. Have him look in the mirror for a perfect set of teeth. If he does not find them, then stress more definitely clean mouth habits, trips to the dentist, and more looking in the mirror until he sees in himself the pupil with clean, sound teeth, equipped for health, comfort, and usefulness.

Teach the pupil to demand of himself perfection, to demand of himself mouth cleanliness that will make him unashamed to face the world. When these dental health habits become ideals in consciousness, he will keep his mouth clean and visit the dentist with less thought of the drudgery of the process, and more thought of appreciation for service rendered, and enjoy the anticipation of the health-giving reward.

Every pupil should be taught to have his own toothbrush, how to care for it and keep it clean; how to brush down on the maxillary teeth, and up on the mandibular teeth; how to stimulate healthy action of the gums; how to clean the inside of the teeth as well as the outside; how to clean the grinding surfaces; how to use the tooth paste; how to rinse the mouth and throat; and why. He should know that he has the right to and can have a clean, perfect set of teeth.

BUILDING SOUND TEETH

But there is another side to this dental health education which is important to consider in our school regimen, and this is my second point, building sound teeth.

We are all familiar with the well-known verse:

> Heaven is not reached by a single bound,
> But we build the ladder by which we rise
> From the lowly earth to the vaulted skies,
> And mount to its summit round by round.

Everything desirable and good is attained through progress and growth. All progress is a building process. All growth is building and all building is growth. Without building by growth, and growth by building, existence would be uninteresting. What is more, without this process existence could not be maintained.

Stagnation means decay, decay means disease, and disease means death. Then to escape decay, disease, and death, in other words to keep normal, natural, healthful, fit, we must keep active, building and growing.

This building, growing activity is evident in everything about us. It is wonderful to go into an arboretum and see the many varieties of plant life all building their character from the same soil. I have seen many varieties of pine, oak, maple, elm, and birch; some one hundred and fifty varieties of lilac; to say nothing of flowers of every description and color, each endowed with properties peculiar to itself for building the particular form and quality

to designate its own species. Differentiation of species is endless, but always unerring. To contemplate this variety of plant life coming from each plant's ability to select from the soil and air the elements necessary for its growth; to consider that out of the soil and air was assimilated material for roots, trunk, branch, bark, leaf, flower, fruit, and seed; to note that even color and perfume were selected from the same sources, according to the sort and habit of the plant; to observe pine, lilac, rose, and geranium all building their substance, odor, and color, using only those constituents peculiar to their growing needs brings one in touch with the principal by which all plant life grows into its proper structure.

The mineral kingdom also affords as great an example of selection of material for building to produce kind, quality, and value of ore, stone, or gem; for these too are the growth of ages, although we understand them less.

And what of the animal kingdom with its body building? The same process of selection of materials entering into the growth of organs, parts, fluids, flesh, nerve, and bone produces all that is needed for a strong, healthy, useful physique. Whether it be an ameba, fish, bird, elephant, leopard, horse, or sheep, all select their food to build their bodies according to their requirements of growth, unconsciously working to produce perfect bodies built for strength, comfort, health, and usefulness. It is interesting to study the materials used in the building of these animal bodies. The scales of a fish, the feathers of a bird, the hide of an elephant, the fur of a leopard, the hair of a horse, the wool of a lamb, all these are built by assimilation, and the material necessary to growth is to be found in the food they eat. Each animal is endowed with ability to assimilate from its food the elements necessary to meet the needs of its growing body, intuitively selecting the right kinds of food.

The human body of flesh and bone, with its anatomic and physiologic construction, is built from the food man eats. The structure of the material body seems to embody all the elements of material creation. While plants and minerals have capacity to assimilate only certain materials that are good for them, man seems to be able to assimilate both good and bad foods, progressing or deteriorating accordingly, and he is held accountable for the kind of body he builds. His choice of foods involves a responsibility, and the nearer he reaches a state of intelligence where his habits prompt him to choose only what is good for his growing body, the nearer he assumes the characteristics and qualities of a normal man with a perfect body and good health. It is certain that his material body grows by the food he eats. Man is so constituted that this process of body building must be carried on through a wise selection of building elements from plant, mineral, and animal foods if he would grow a strong, useful, and healthy body.

Prehistoric man, and man in the early years of history, seemed to exercise a better body building intelligence than the man of today. This may have been because his eating was a more unconscious process, like that of plants and animals about him. Because there was no artificial adulteration of foods to tempt him to digress, his natural assimilating ability was not interfered with

and his eating was more of an incident in his living, than his living an incident in his eating.

Since eating, instead of living, has come to be such an important factor with man, he must look well to his selection of foods or his body will suffer. With a multiplicity of foods, and an extreme adulteration of foods, a complication of food combinations, overeating and an abnormal taste for things to eat that are not foods, there arises a matter-of-fact need for dietary control.

We are living in an age of advanced ideas regarding body building. Foods that served the body ten years ago, and combinations of food that were considered ideal then, are not the nutrition ideals of today. The valuable research of Luther Burbank has proved conclusively that plants can be trained to select and assimilate building materials to enhance their appearance, improve their quality, and increase their value and usefulness. Likewise the efforts of many today, who are carrying on for the improvement of the human body, prove that there is a search after a principal or power which directs and controls the choice of foods, their laws of assimilation, and their body-building processes. As these nature processes unfold to us, new light will be thrown upon body building.

The present age is one of research and experimentation. Through these agencies much has been uncovered in the way of wrong food habits, and much has been discovered and proved to be common sense and efficacy with regard to right eating as a factor in the building of strong, healthy, physical constitutions, as well as in their maintenance and correction when not normal, and the end is not yet. We are still making progress in the building and growing of strong, healthy, useful men. Fifty years from now, if not sooner, men will be eating less, and living more. They will not be living merely to eat. They will have better habits of diet, a more intelligent appreciation of food values, and the results will be made known in a more natural assimilation of elements that will build and keep in normal growth material bodies more nearly measuring up to the standards of creation.

As we mount round by round the ladder of progress, we shall arrive at a state of understanding where we shall be able to control our bodies in their natural and normal state of health and physical fitness; then food and growth will combine harmoniously to produce a race physically fit and mentally alert. Until then we must use the means at hand to make this progress as rapid as possible.

What we have to consider in dental health instruction is the building of sound teeth, and we know that teeth are built by the food we eat. Eating for teeth is receiving a large consideration in the nutrition world today. A well-rounded diet is the dental health appeal. A diet containing enough of the tooth-building elements to insure sound teeth and good health.

Through research carried on with rats and guinea pigs it has been found that teeth can be built up or destroyed by the food supplied. This has been proved so definitely that we should be convinced of the necessity of choosing bone-building foods if we would have strong teeth and good bodies.

To be convinced that a well-balanced diet should be taught to the school child as a dental health requirement is one thing, but to present it in the schoolroom in a way to correlate with the modern trend of public school education is quite another thing.

I have been working at this problem for twelve years. It is a most interesting task. The returns for the effort expended are very gratifying. We have found that the situation calls for much originality and resourcefulness, and continual change of subject matter. In the Peoria schools the lecture plan, the story plan, the stereopticon plan, the picture coloring plan, and the poster project plan, have all been successfully used. Most of the work this year has been along the line of the picture coloring plan combined with supplementary reading. The results obtained far exceeded our expectations. The year has been a very happy one and teachers and pupils alike cooperated most satisfactorily.

I shall give you a few of the simple plans I have used during the year in connection with supplementary reading material and mimeograph matter for seat work and coloring.

Mimeographed drawings of vegetables and fruits were supplied to each kindergarten pupil for coloring and a letter of suggestion was given to each teacher as follows:

To Kindergarten Teachers:

This letter is my attempt to help you to present to your kindergarten pupils as simply as possible the following information:

Teeth must be fed to make them grow, just as the rest of the body needs food to make it grow.

Some kinds of food have something in them to make bones and teeth grow strong and good.

It is very nice to have good, strong teeth.

Good, strong teeth help to keep us well, happy, and useful.

How many would like to know the kinds of food that make good teeth?

VEGETABLES

Vegetables with leafy tops are the best.

These leafy top vegetables have something in them (minerals, iron, and calcium) which help to make rich, red, good blood. The blood carries this material to the teeth and bones and makes them grow to be strong and good.

We shall pick out the vegetables that have leafy tops:

Cabbage	Spinach	Greens	Asparagus
Onions	Celery	Lettuce	Cauliflower

Eat some of these every day so as to make the teeth and bones strong.

There are other kinds of vegetables called "root vegetables" because the part we eat grows under the ground. These are very good foods to make our bodies strong and healthy. The best part of these root vegetables (the mineral part) is just under the skin of the roots. So if mother cooks these vegetables with the skins on, you will get the best part to make your teeth and body strong. If these root vegetables are peeled before they are cooked, then it is well to use the water in which they are cooked in serving the vegetables (this last for the mothers when you have the opportunity to pass it on to them).

We shall pick out the root vegetables:

Potatoes	Carrots	Beets	Turnips	Squash
Parsnips	Radishes	Onions	Salsify	Sweet potatoes

Then there are the seed vegetables which are good to eat. We shall pick out the seed vegetables:

Peas String beans Lima beans Sweet corn

Raw vegetables, like celery, cabbage, lettuce, and carrots, are good toothbrushes if eaten at the end of the meal. Why?

FRUITS

Fruits have something in them to help build good teeth and good bodies.

Fruits have sweet sugar in them that is better for us than the kind of sugar we get in candy.

Fruits are much better than candy.

Fruits have something in them to make rich, red blood which carries the right kind of material to our teeth and bones and the rest of our bodies. Candy is not a friend to good teeth, but fruit is one of our very best tooth friends.

We shall pick out the juicy fruits.

Oranges Grapefruit Lemons

The tomato is a fruit. Tomato juice is very good for us to drink so that we may have good, strong teeth and bones and bodies.

Would you like to know some kinds of fruit that are very good to eat that are better for us than candy?

Dates	Raisins	Figs	Prunes	Apricots
Grapes	Plums	Pears	Peaches	Pineapple

The raw apple eaten at the close of a meal is the best kind of toothbrush.

To have strong, healthy bodies we must eat lots of milk, fruits, and vegetables.

The vegetable and fruit sheets are for each pupil to color or use in any way you may see fit.

(Signed) ----------

Supervisor of Dental Health.

A Christmas Project

Following is a Christmas project for supplementary reading and coloring given to fourth grades:

To Teachers of Fourth Grades:

In presenting this supplementary reading and picture coloring lesson for the Christmas time we have in mind the importance of a common sense diet for the growing child of school age.

Dental health has to do with establishing normal function. In order that girls and boys may be at their best physically and mentally, teeth must be sound, straight, and fit together properly.

To lay a foundation for dental health we begin with the food we eat. Recent research has shown that dental health makes all body tissues healthy and strong.

As a result of special study and experiment it has been learned that the growing child has a definite calcium requirement. If his teeth and other body tissues are to be maintained in a normal state of health, this calcium requirement must be provided for through the daily use of foods rich in calcium. A diet of milk and orange juice is a complete food ration sufficient to meet the calcium requirement of an infant. As the baby grows older, vegetables, fruits, cereals, eggs, and meat in moderation, are added to the diet. But it must be known that growing girls and boys need a sufficient quantity of milk every day along with the vegetables, fruit, cereal, egg, and meat values, in order to etablish a proper storage of calcium and insure adequate tissue development, which will result in good bones and teeth.

This Christmas lesson deals definitely with milk as an important factor in the diet. The pupil should know that carefully controlled experiments with the food habits of girls and boys establish the fact that one quart of milk a day for each growing child seems necessary for a sufficient supply of calcium for good bones and teeth. This habit of drinking a quart of milk a day should be continued until the girl or boy is at least fourteen years of age.

We have been stressing milk foods because growing girls and boys utilize the calcium in milk more efficiently than they do in vegetables. However, in order that the body tissues may be in the best possible health and the teeth better able to resist decay, the girl and boy must have a well-balanced diet, which means a liberal supply of vegetables, fruits, cereals, and eggs, fish or meat, as well as the quart of milk a day.

Christmas seems to be connected with plenty to eat. Will you not help the girls and boys to select the right kinds of food during the Christmas season for the health of their bodies and teeth? An excess of candy is no friend to health and is a direct enemy to sound teeth. Candy sticking to the teeth, with the help of the saliva, makes a syrup which works its way into the grooves of the teeth. This sticky mass becomes a hotbed of decay to ruin teeth. What is more, an excess of candy takes away the desire to eat the right kinds of food at mealtimes. As a result we have girls and boys underweight and undernourished, with poor digestion and bad teeth.

I should like to have the two best colored pictures in your room for exhibit purposes.

(Signed) ----------
Supervisor of Dental Health.

A Good Breakfast Project

With a supplementary reader entitled *The Travels of a Rolled Oat,* we gave the following letter to each pupil of the fifth grade.

To the Girls and Boys of the Fifth Grade:

Good morning!

It is breakfast time! What a happy time!

In every land many breakfast tables are the wholesome beginning of every day.

Make the following your breakfast ideal.

I will start the day with a good breakfast.

A good breakfast will help me to think, study, work, and play better.

I should give myself plenty of time to eat my breakfast. I should not eat hurriedly or nervously.

I should be cheerful while I eat.

1. I should have a glass of milk or a hot drink made of milk.
2. I should have a whole cooked grain cereal with milk and a very little sugar.
3. I should have some fruit for breakfast.
4. I should have some whole wheat bread thoroughly toasted with good butter on it. Toast baked in the oven is best.
5. I should have eggs for breakfast occasionally.

These foods furnish material to help build good teeth.

I will chew my food well to exercise my jaws.

I will keep my teeth clean.

I will have my teeth examined by a dentist twice a year.

Any whole grain cooked cereal is good for breakfast.

Rolled oats with whole milk is a good breakfast food.

The Travels of a Rolled Oat is the name of a book which explains how oats are prepared for breakfast food. I will enjoy my breakfast more after I have read this book.

(Signed) ----------
Supervisor of Dental Health.

May Day Project

For a May Day project we left with each pupil of the sixth grade in every school in our system a leaflet with a supplementary reading lesson on one side and picture to color on the other. We also gave to each pupil the following personal mimeographed letter for silent reading:

To Girls and Boys of the Sixth Grade:

A clean mouth with a perfect set of teeth is the first and best health habit.

The mouth is the doorway to the body. Keep the mouth clean and be more sure of a healthy body.

Good, clean teeth kept in good repair are elements of good health and respectability.

Teeth are built by the food we eat. Learn to know your food. Dental health foods make all body tissues healthy and strong.

Natural sweets are to be found in milk, in vegetables, and in fresh and dried fruits.

Raw fruits and raw vegetables should have a large place in the diet.

Cereals and whole wheat bread are good foods, to combine with eggs, milk and all its products, fruits, vegetables, fish, lamb, and beef.

The vegetables with the leafy tops are the best tooth and bone builders.

The benefits of a clean mouth, a perfect set of teeth, and a well-balanced diet cannot be overestimated.

"The Happy Family at May Day," is a story that brings to your attention the right kinds of foods to eat. You will enjoy the story more because it is a good food story.

(Signed) _____
Supervisor of Dental Health.

These are just a few of the many ways that we have of presenting the subject matter to the pupil. Teachers and pupils alike are enthusiastic in carrying out the plan.

The National Dairy Council has much valuable material on good tooth building to help the teacher in the classroom, but an additional value can be added to their material by personal letters from the educator in charge to the teachers and pupils.

A STUDY OF THE LIABILITY TO DECAY, OF THE DECIDUOUS TEETH OF SCHOOL CHILDREN*†

H. SHIRLEY DWYER, D.D.S., NEW YORK, N. Y.

INTRODUCTION.—Dental literature shows a marked recent increase in the number of articles pertaining to dentistry for children. There is an increasing demand for essayists and clinicians on the subject of pedodontia. There is a gradual awakening of our profession to the importance of, and necessity for, adequate dental service for our child patients. Please note the expression just used: "*adequate* dental service for our child patients." The day is rapidly approaching when the public will *demand* dental service for the little ones. When that day comes, let us hope that our profession will be prepared to meet this demand with *adequate* service. One of the most disheartening obstacles to be overcome by public health workers is the indifference of too many members of our profession to the dental needs of children, even when such needs are pointed out to them. The recent barometric "low" in business activities has resulted in some good. High priced restorations having failed to interest adult patients, more attention has been given to the junior side of dental practice.

It does not seem logical that any dentist would refuse work. What is the explanation for the apathy and indifference on the part of some of our profession? Possibly it is due to the very evident deficiency, at the colleges, in the handling of child patients and in the necessary modification of operative technic. It should be very encouraging to our Society to find our dental schools beginning to recognize this deficiency in the curriculum, and to take measures to remedy it. What of the man who graduated ten or more years ago? Textbooks? Yes. In all the literature of dentistry we have, I believe, but three recognized books dealing with dentistry for children. A few of our more modern textbooks on operative dentistry give brief notice of the fact that children do have teeth. One excellent text on dental anatomy of recent origin nonchalantly dismisses the entire deciduous dentition in five pages, in a total of three hundred. We cannot wonder at the lack of attention to this subject in the dental curriculum, nor at the dearth of informative literature relating to it, when we consider that both colleges and authors are faced by the same great difficulty—the deficiency of acceptable data in regard to the deciduous teeth. We are groping our way through uncharted waters and, like the cautious pilot, should repeatedly take "soundings." This brief paper, a preliminary report, does not relieve the dilemmas of either the authors or the colleges. It is one of a series of "soundings," which like those of the mariner must be oft repeated and carefully verified.

*A preliminary report. Read by title at the tenth general meeting of the International Association for Dental Research, Columbus, Ohio, March 19 to 20, 1932; reprinted from Journal of Dental Research, 1932, xii, p. 516. Presented at the annual meeting of the Association for the Promotion of Dentistry for Children, Buffalo, N. Y., September 12, 1932.

†From the Child Research Clinic, Dental School, New York University, New York City.

The absolute futility of attempting to correlate the numerous public-health dental reports issued from various sources in this country and abroad, because of their lack of standardized examination technic, has been repeatedly demonstrated. Great care has therefore been exercised in securing and preparing the data used in this paper, so that any one may repeat the work in exactly the same manner as that outlined here.

Procedure.—The examiners were thoroughly experienced dental hygienists, carefully instructed for this work and under strict supervision. Four groups of hygienists were utilized; some were health department workers; all were under strict supervision of a capable dentist. Each examination was checked by another worker (hygienist or dentist) for verification. Charting was done at the chair following a cleansing.

Type of Examination.—This was a Walker Class II,[1] modified by absence of magnification. To state this more definitely: the examination was made under "good" to "excellent" light, following thorough prophylaxis. Dryness was assured by the use of cotton. The instruments were a good mouth mirror and a sharp explorer of the type of the No. 17 S. S. White. No magnifying lenses were used.

Source of Material.—Children of almost every race that inhabits New York City were included, from the poorest sections to the better-class homes; from preschool to high school. No nationality, sex, nor economic status predominated, although this report is based on females only. Whether there are any differences due to sex, cannot yet be stated. Neither private- nor parochial-school children were included. I desire to express to the Chief of the Dental Division of New York City, Dr. Harry Strusser, my sincere appreciation of his kindness and helpfulness in allowing me to secure some of my data through his Division. His cooperation made possible the examination of some of the grades used in this study.

Methods of Recording.—All detectable pits and fissures, carious cavities, badly decayed and missing teeth, were noted, as well as the surface location of defects. A "badly decayed" tooth was one in which caries had so far progressed as to involve all or most all of the coronal portion, and more than one surface. Separate cavities on a surface were recorded separately, for several cavities may occur on one surface. It may be necessary for the dentist to join these cavities into one, but they were separate cavities at the time of examination—a hygienist records but does not diagnose. The data on the record cards were transferred to a master sheet such as is used in our Child Research Clinic at New York University. This master sheet facilitates a very detailed record of each tooth, surface, and condition. From the large sheets, the final statistics were compiled.

Results.—The material was gathered, recorded and compiled with no preconceived theory to be proved, nor dogma to be upheld. The compilations, I believe, are as nearly mathematically correct as approved methods and aids can make them. From three to four checks as to their accuracy were made by the system used. Bias could not and did not enter into the work. The presentation of this material follows the logical sequence of tooth and then surface; and where "tooth" or "teeth" appears, *deciduous* teeth are meant, unless otherwise stated.

Our first question is: which teeth are most liable to caries? In considering caries liability of deciduous teeth, we have a more difficult problem than for the permanent teeth because of the factor of exfoliation. To eliminate this variable, the caries liability was worked out in percentage of the remaining defective teeth. Table I shows the average percentage of caries per defective tooth over a period of six years—from the age of six to eleven years. The data in Table I should not be regarded as indicating the individual liability, to caries, of any tooth at a specific age. Table I shows the average liability over a period of time. Thus, tooth G (maxillary left lateral incisor), at the age of six years is 80 per cent perfect, and at eleven years is 99 per cent missing, but its average liability during the age period of six to eleven years is 5 per cent. The data in this table indicate that there is a bilaterality of defects in the deciduous teeth, as Dr. Hyatt has shown for the permanent teeth. This bilaterality was also confirmed by a survey made by the New York City Department of Health, although their tables were limited to the molar teeth.[2] From this table we also note that the teeth of highest liability are the

TABLE I

AVERAGE PERCENTAGE OF DEFECTS PER TOOTH OVER A PERIOD OF SIX YEARS, AGES SIX TO ELEVEN YEARS; DEFECTIVE TEETH ONLY

	TOOTH	PERCENTAGE	PERCENTAGE	TOOTH	
UR	2M	53	49	2M	UL
	1M	29	30	1M	
	Cu	10	12	Cu	
	L	5	6	L	
	C	4	4	C	
LR	2M	47	45	2M	LL
	1M	36	36	1M	
	Cu	7	7	Cu	
	L	0.5	1	L	
	C	0.3	0.2	C	

molars. Our clinical impressions sometimes lead us to believe that the anterior teeth are more liable to caries that is actually the case. Possibly this arises from the fact that the operative problem is usually more difficult of solution in the deciduous anterior teeth when we find them broken down.

Some of the complications brought about by the factor of exfoliation are illustrated in Table II. This shows a perfectly logical progression. Although it relates only to the maxillary right second molar, it applies equally to each of the other teeth. The ratio between defective teeth and remaining teeth is almost a constant.

As the deciduous molar teeth, like the molars of the permanent dentition, are by far the most liable to caries, let us inquire as to the surface liability. Of all defective mandibular second molars, at the age of five years, the highest percentage of defects occurs on the occlusal surface—approximately 65 per cent. In this same age group, 38 per cent of the mandibular second molars are already badly decayed. On comparing the liability of different surfaces of different teeth to be defective, the occlusal surfaces of the maxillary molars are found to be more than twice that of the mesial surface of the maxillary central incisors. This proportion increases

with the age of the child. At six years, there are more than six times as many defects on the occlusal surface of the maxillary second molars as on the mesial surfaces of the central incisors. At seven years, the occlusal surface is almost sixteen times as liable. Again the factor of exfoliation complicates the problem, these figures having been recorded for teeth that remain at those ages.

TABLE II
PERFECT, MISSING, DEFECTIVE, MAXILLARY SECOND DECIDUOUS MOLARS, ACCORDING TO AGE

AGE	PERFECT PERCENTAGE	MISSING PERCENTAGE	DEFECTIVE PERCENTAGE
5	22	2.0	76
6	25	1.9	73
7	23	4.0	73
8	18	14.0	68
9	4	44.0	52
10	8	58.0	34
11	4	77.0	19

In considering the defective surfaces of the maxillary second molars at five, six and seven years, defects are located as shown in Table III. The increased

TABLE III
LOCATION OF DEFECTS IN DEFECTIVE MAXILLARY SECOND DECIDUOUS MOLARS

SURFACE	5 YEARS PERCENTAGE	6 YEARS PERCENTAGE	7 YEARS PERCENTAGE
Occlusal	56.0	78	51
Mesial	17.0	13	26
Distal	5.0	2	2
Lingual	14.0	4	8
Buccal	0.9	0	0
Mesioclusal	5.1	2	9
Distoclusal	2.0	1	4

percentage of mesial caries probably is reflected in the reduction in the percentage of occlusal defects. A very significant fact is the finding that the liability to distal caries on the deciduous second molars is very low. The picture for the mandibular molars is only slightly different. As in the adult dentition, the principal change occurs in the increased liability of the buccal surface (Table IV). Again we note

TABLE IV
LOCATION OF DEFECTS IN DEFECTIVE MANDIBULAR SECOND DECIDUOUS MOLARS

SURFACE	5 YEARS PERCENTAGE	6 YEARS PERCENTAGE	7 YEARS PERCENTAGE
Occlusal	65	74	68
Mesial	14	17	13
Distal	3	4	2
Lingual	0	0	0
Buccal	5	2.5	0
Mesioclusal	10	2.5	14
Distoclusal	3	0	3

the preponderance of occlusal defects, the number of mesial defects, and the almost negligible number of defects, on the distal surface. This group of figures (Table IV) has been purposely limited to the five-, six-, and seven-year groups, to avoid

TABLE V

COMPARISON OF THE DISTRIBUTION OF DEFECTS IN DECIDUOUS SECOND MOLARS AND IN PERMANENT FIRST MOLARS

SURFACE	MAXILLARY		MANDIBULAR	
	DECIDUOUS PERCENTAGE	PERMANENT PERCENTAGE	DECIDUOUS PERCENTAGE	PERMANENT PERCENTAGE
Occlusal	63	81.0	69	72.6
Mesial	24	10.0	15	7.5
Distal	2	3.2	3	3.3
Lingual	6	22.5	0	1.2
Buccal	0	3.1	3	35.1

as much as possible the factor of premature exfoliation or loss through extraction. More than 300 cases were used in this grouping.

Table V facilitates comparison of our average percentages for the five-, six-, and seven-year groups with similar data, relating to permanent teeth (sixteen to twenty years), from statistics obtained by Dr. T. P. Hyatt (not yet published). The outstanding differences between the two dentitions are the greater proportion of mesial defects in the deciduous teeth, and of lingual and buccal defects in maxillary and mandibular permanent teeth, respectively.

In the deciduous dentition there is a much greater difference between the first and second molars than in the permanent teeth. The anatomic forms of the two teeth are markedly different, as are also the caries liabilities. The first deciduous molar is not nearly so prone to decay as is the second, and it is very much less likely to have structural defects, such as pits and fissures. Data relating to the deciduous first molars, similar to those for the second, are given in Table VI. In the first molar, both maxillary and mandibular, the distal defects are the most conspicuous, this preponderance continuing as long as there are any first molars. Possibly this is due to the fact that the first molars are usually more or less dome shaped, lacking in pits and fissures, and therefore nonretentive of food or bacterial plaques, whereas their occlusal surface is comparatively smooth, their sloping sides tending to pack food debris between the first and second molars.

TABLE VI

LIABILITY OF SPECIFIC SURFACES OF DECIDUOUS FIRST MOLARS

SURFACE	MAXILLARY			MANDIBULAR		
	5 YEARS PERCENTAGE	6 YEARS PERCENTAGE	7 YEARS PERCENTAGE	5 YEARS PERCENTAGE	6 YEARS PERCENTAGE	7 YEARS PERCENTAGE
Occlusal	17	25	20	33	27	20
Mesial	25	17	14	9	3	11
Distal	42	48	43	34	48	34
Lingual	0	0	0	0	0	0
Buccal	0	0	0	4	0	0
Mesioclusal	5	4	3	0	4	5
Distoclusal	11	6	20	20	18	30

The deciduous canines show a greater liability on their distal surfaces, as do the permanent canines. In the maxillary incisors, the greatest liability is on the mesial surfaces. This is specially noticeable in the maxillary lateral incisors, where the mesial surface is over six times more liable to caries than the distal surface at the age of six years—just prior to exfoliation. The six mandibular anterior teeth have the highest degree of "immunity," as is true also of the permanent dentition. The largest number of carious cavities found in any one mouth in our examinations was 36—in a girl six years old, one in a group of 2000. Fortunately such extreme cases are rare.

This work is in progress. Any suggestions, or corrections of the methods employed, would be very welcome. It is my sincere hope that this preliminary report may stimulate similar work elsewhere. The car you drive could never have been built if an accumulation of acceptable facts had not been at the service of the engineers and designers. To give adequate dental service to our child patients, we must have facts not fancies on which to build.

REFERENCES

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SPACE MAINTAINERS FEATURING THE USE OF STAINLESS STEEL

ERIC H. GOLDEN, D.D.S., M.S.D., ST. LOUIS, MO.

THE importance of maintaining the spaces in the deciduous and mixed dentition when deciduous teeth are lost prematurely is being recognized more now than ever before. However, there is still some doubt shown in regard to the percentage of cases where lack of space maintenance was a direct causative factor of a malrelation of the permanent teeth and inharmony in the arches. To determine the percentage of cases of malocclusion the direct cause of which was lack of space maintenance, I made a survey of approximately five hundred cases taken from practice and checked the number of cases in deciduous and mixed dentitions that showed malrelations due to premature loss of deciduous teeth only. In my opinion the percentage is rather high.

At a clinic given at the Missouri State Dental Association meeting, May 15-18, 1933, in St. Louis, I presented photographs of one hundred and twenty-five cases of malocclusion due directly to lack of space maintenance. The result was commendable due to the lively interest shown in these photographs, thus creating the desire to make use of the preventive measures, namely space maintainers.

The material heretofore advisable for the construction of space maintainers has been the precious metal alloys as used for orthodontia appliances.

Stainless steel is particularly suitable not only because of its absolute immunity from corrosion by the oral fluids (a fact that has been conclusively proved by extensive research and long practical experience) but also because of its extraordinary tensile strength, which is nearly twice that of gold.

Parts made of stainless steel need be only half as thick, when desired, as those made of gold, in order to be equally proof against fracture, while the difference in weight in favor of stainless steel is even more considerable, as gold has a much higher specific gravity than stainless steel.

Only when highly polished does it possess its outstanding characteristics.

It can be soldered with soft or hard solder; the springiness is increased by bending with pliers as in the case of bands; also if some of the temper is lost when soldering, it is replaced by vibrating or when polishing; it lends itself admirably for use in making space maintainers.

The technic used in the construction of these appliances differs somewhat from that of the precious metal appliances. Its extraordinary tensile strength is of value in the mixed dentition for the reason that we do not have a balanced force of occlusion where some of the deciduous teeth are lost, anchorage is always a problem, and many times a child exerts enormous force on various parts of the denture.

In using the same gauges of metal to which we have been accustomed in making retainers of platinum gold alloys, we have the same adaptability with

the factor of added strength, resulting in permanence, in spite of the fact that in the majority of cases there is no tooth preparation.

As stainless steel is not attacked by the oral fluids, there is no discoloration, decomposition, metallic taste or injurious effects, it being in fact more sanitary than the precious metal alloys, for there is never an adherence of plaque on this metal when highly polished.

The appearance of this metal is comparative to platinum in color and takes a very high polish, so being less conspicuous than any of the precious metal alloys used in the oral cavity.

As this metal is more difficult to hard solder, the only appliances that are hard soldered are those using crowns for anchorage. The advisable technic is to cover a tunsten needle with solder and after fluxing the parts, heat fast (an ordinary gas flame can be used) and tease the solder along the joint with the needle, at no time having the heat greater than would cause the metal to appear dull red.

A National Orthodontic blowpipe with a special tip of 0.036, 0.028, 0.030, depending upon your needs, is advisable, using a fine needle flame with little air pressure. A needle point flame is advocated. A black background is best when soldering; working over a piece of black (ebony) asbestos switchboard is ideal.

A high carat gold solder (in wire form, 28 gauge)—18 carat—is advised, using a flux compound of potassium fluoride and boric acid, 50-50 with a few drops of hydrochloric acid and water 50-50 added to make a sloppy mix. Always place solder on smallest piece first, use plenty of flux.

If some of the spring is lost while soldering, it can be replaced by placing the appliance on an electric vibrator, polishing or brushing and by working with pliers.

After the appliance is complete, it is pickled for about three minutes in a solution of hydrochloric acid (USP) and water 50-50, and to this volume 5 per cent nitric acid is added.

The soldering of the rest of the space maintainers is done entirely with pure block tin using a small electric soldering iron. Block tin is used because it is neutral, showing no reaction to the oral fluids and has shown greater tensile strength by test than the soft solders advised by the government or state regulations which prohibit the use of an alloy containing lead in contact with food products. The flux used is one-third each of zinc chloride, hydrochloric acid (USP), and water.

Polishing is done by means of a stiff bristle brush, using pumice powder, polish paste and whiting, respectively, or any of the polishing compounds on the market for stainless steel.

To describe the construction of the various appliances illustrated:

Fig. 1 illustrates a space maintainer for the prematurely lost left mandibular deciduous first molar. The second deciduous molar band, for added strength, is made of 0.005 stainless steel, a pinched joint in center on mesial part of the tooth is made, and by contouring the band to spring over the crown of the molar we have a spring fit which is a great advantage for retention of the band.

This applies to all subsequent bands described. The separating bar is of No. 18 gauge stainless steel and is bent to spring together against pinched ends on mesial of tooth thus giving added strength where it is soldered with block tin. An ample amount of tin is used, thus allowing no ledges and gaining in strength; also solder is flowed on the buccal and lingual surfaces of the anchor band to give added rigidity. Observe that the separating bar is adapted close to and below the top of the ridge in the deciduous first molar region and over the ridge approximating the deciduous canine to avoid undue stress of mastication on it, and being of heavy gauge and of stainless steel is not disturbed.

Fig. 1.

Fig. 2.

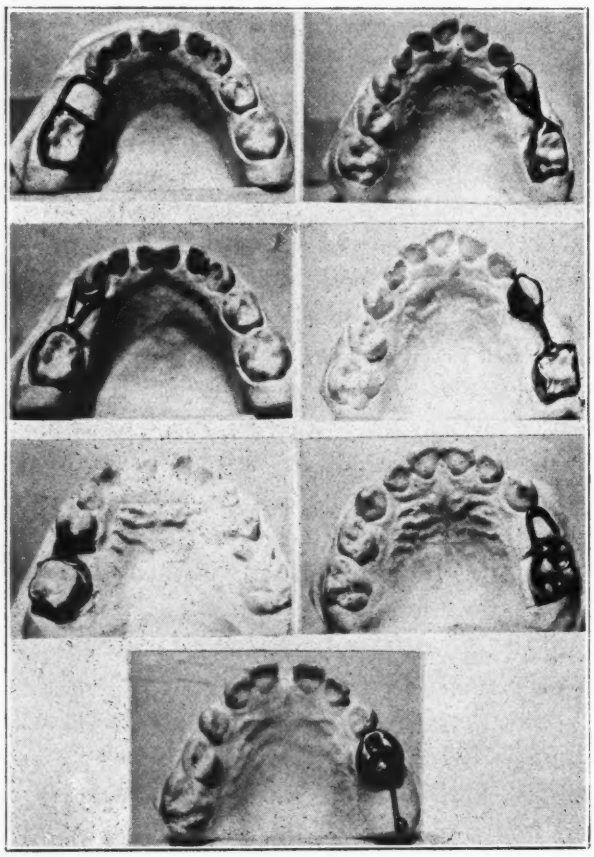

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 1.—A stainless steel space maintainer banding the left mandibular deciduous second molar, with separating bar. Block tin used for solder.

Fig. 2.—A stainless steel space maintainer banding the left maxillary deciduous second molar and deciduous canine, with separating bar. Block tin used for solder.

Fig. 3.—A stainless steel space maintainer banding the left mandibular second deciduous molar. Separating bar adapted to encircle the labial third and lingual third of the deciduous canine. Block tin used for solder.

Fig. 4.—A stainless steel space maintainer banding the left maxillary second deciduous molar and deciduous canine, the separating bar fitting into a tube soldered to the deciduous canine allowing for growth. Block tin used for solder.

Fig. 5.—A stainless steel space maintainer banding the right maxillary first permanent molar, the spring bar pressing against the first premolar is adjustable for gaining space for unerupted second premolar. Block tin used for solder.

Fig. 6.—A stainless steel space maintainer crowning the left maxillary deciduous first molar, occlusal portion being cut away. The separating bar and crown soldered with gold solder.

Fig. 7.—A stainless steel space maintainer crowning the left maxillary deciduous first molar. Separating bar balled at end preventing erupting first permanent molar from drifting mesially. The separating bar and crown soldered with gold solder.

Fig. 2 illustrates a space maintainer for the prematurely lost left maxillary deciduous first molar.

The second deciduous molar is banded as described in Fig. 1, also the deciduous canine (the pinched ends being on the mesial surface of the deciduous molar band and on the distal of the deciduous canine band). Two 20 gauge wires are twisted together, and the ends are sprung to press against the pinched ends of the canine and molar bands, giving added strength. An ample amount of tin is flowed at either end in this region as explained in Fig. 1 and also on twisted intervening part of the wire, giving a very strong appliance.

Fig. 3 illustrates a space maintainer for a prematurely lost left mandibular first molar. The molar band is made as described previously, and the separating bar is bent to adapt around the deciduous canine (a loop being made encircling the labial third and lingual third of the canine), and the two ends are sprung against the pinched ends of the molar band. An ample amount of tin is flowed around this joint and on either side of the band; also solder is flowed on each end of loop which clasps around the canine.

Fig. 4 illustrates a space maintainer for a prematurely lost left maxillary deciduous first molar, being made the same as in the case of Fig. 2 with the exception that an 18 gauge bar is used making a right angle bend on the end to be soldered on the molar band, a notch is cut in the pinched ends of the molar band at about the center. This bar is adapted to fit in a tube which is soldered on the distal edge of the canine band into which the bar fits, thus allowing for growth.

Fig. 5 illustrates a space maintainer for a prematurely lost maxillary right deciduous second molar. Where drifting has occurred, it can be adjusted to re-establish and maintain the proper space for the unerupted second premolar.

The adjustment is accomplished by removing the band and bending the spring bar to press against the permanent first premolar. The band for the first permanent molar is made as described previously but the pinched ends are on the lingual. A notch is cut at about the middle of the band, and the bar is laid in this and extends to the distal surface of the band for strength and is soldered, the solder extending all along the lingual surface of the band.

Fig. 6 illustrates a space maintainer for the prematurely lost left maxillary deciduous first molar.

The second deciduous molar is crowned (no preparation of the tooth being made); the occlusal surface of the crown of 0.003 stainless steel is swaged from the occlusal surface of the deciduous crown and soldered to the band of 0.005 with hard solder (using flux and solder explained previously in this paper), the occlusal cusp portions being ground off as illustrated. The separating bar of 18 gauge wire is bent in a pyramid shape; the base rests against the crown and is soldered with hard solder; the apex is in approximal contact with the deciduous canine. The technic of making the shell crown is the same as that used for a permanent tooth except that in this case the crown is made to conform to the deciduous molar.

Fig. 7 illustrates a space maintainer for a prematurely lost left maxillary deciduous second molar. The molar crown is made as described in Fig. 6, using hard solder, the band is of 0.005 but the occlusal portion is of 0.002, swaged

from occlusal of deciduous crown. The 18 gauge bar extending distally maintains the space of the second deciduous molar when the first permanent molar erupts. The bar is adapted along the ridge distal to the molar crown, and at the end it is balled with solder. When the first permanent molar erupts, it cannot drift mesially into the second premolar space.

Proper space maintenance is a real service to be rendered to the young patient. A serious type of malocclusion in later years involving a lengthy treatment which may never give the individual the proper development of the correlated structures is avoided. In addition, it is a class of service for which the parents and patients will feel deeply grateful long after the small expense and slight inconvenience of wearing the appliance are forgotten.

Department of Orthodontic Abstracts and Reviews

By Dr. Egon Neustadt, New York City

The Journal will welcome suggestions from its readers, sent to Dr. Egon Neustadt, 133 East Fifty-Eighth Street, New York City

Malocclusions in Dogs. Abstracted from "Anomalien an Hundegebissen" by Dr. R. Ritter, Fortschritte der Orthodontik, 1933, Berlin, Hermann Meusser.

It is regrettable that our orthodontic literature does not contain more articles of a comparative-anatomical nature. For, no doubt, comparative anatomy represents a rich source of information regarding the etiology of malocclusions. It offers an opportunity to study controversial questions on a material less influenced by environment than man is; among others, the much debated problem of heredity may thus be brought nearer its solution.

In order to evaluate properly the malpositions of teeth found in dogs, it is first necessary to become acquainted with normal conditions. The normal dentition of the dog consists in the maxillary arch of three incisors, one canine, four premolars, and two molars; in the mandibular arch of three incisors, one canine, four premolars and three molars. Variations in the number of teeth are common, and, in such cases, the incident of missing teeth is more frequent than the one of supernumerary teeth.

NORMAL OCCLUSION

Normal mesiodistal relationship is characterized by the following occlusal conditions: the mesiobuccal cusp of the maxillary first molar occludes with the distobuccal groove of the mandibular first molar; this constitutes neutroclusion condition in the dog (Fig. 1); the fourth maxillary premolar is an exceptionally large tooth and is sometimes classified as first maxillary molar; it has, like the other molars, three roots but lacks an occlusal biting surface, being functionally closely related to the premolars; its well-developed distobuccal cusp occludes with the mesiobuccal groove of the mandibular first molar and also with the mandibular fourth premolar. The third, second, and first premolars are not in occlusal contact during centric bite; the mesially inclined occlusal surfaces of the maxillary premolars are opposite the distally inclined occlusal surfaces of the mandibular premolars; the same relationship exists for the canines, except that they have occlusal contact with their opponents. The six maxillary incisors overlap the mandibular incisors about one-sixteenth of an inch. It may be stated that—on the whole—these occlusal relationships are similar to the ones found in men; there is, however, a much greater horizontal and vertical overjet noticeable on the molars and the fourth premolar, which limits the lateral excursions of the mandible to a great extent.

"NORMAL" MALOCCLUSIONS

While the above described occlusal relationship is found in the majority of dogs under normal conditions, it is most interesting to note that some species present a quite typical malocclusion, characterized by a mesial relationship of the mandibular canines and incisors to the maxillary teeth; here belong the bulldogs, boxers, and pugs; the molars and premolars of these dogs show neutroclusion relationship, though pedigreed bulldogs have even been described to possess all the characteristics of true mesioclusion conditions (Angle's Class III). The boxers, however, which have been examined, present neutroclusion

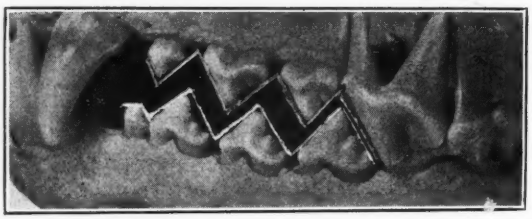

Fig. 1.—Normal occlusion of dog. The buccal cusp of the maxillary fourth premolar occludes with the mesiobuccal groove of the mandibular first molar; the other three maxillary premolars have no occlusal contact with their antagonists.

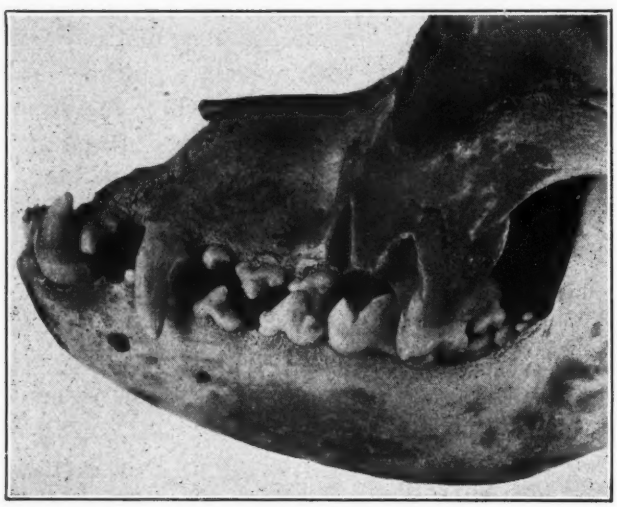

Fig. 2.—Occlusion of boxer (the maxillary fourth premolar has been removed). Neutroclusion, labial malposition of mandibular canines and incisors.

cases with mesial position of the mandibular anterior teeth (Fig. 2); their mandibles are overdeveloped, especially in the canine and incisor region, but it is also evident that the maxillas are correspondingly underdeveloped; the mandibular canine, instead of occluding between maxillary canine and lateral incisor, occludes mesially to the lateral incisor; the mandibular incisors bite mesially to the maxillary incisors.

CONGENITALLY MISSING TEETH AND DRIFTING OF TEETH

The problem of congenitally missing teeth is also found in dogs. The examination of a fox terrier revealed the maxillary left first premolar to be congenitally missing; this had led to a drifting of the adjoining teeth, namely of the second

premolar mesially (Fig. 3), and of the canine distally (as happens so frequently in mouths of human beings); the left third premolar had assumed a position of torsiversion (see normal side), in an attempt to place its largest diameter in the line of the arch (compare the torsiversion of molars in children after the premature loss of deciduous molars). In the mandible, the first premolars were missing on both sides. A brother dog of the same litter had a normal set of teeth.

EXCESSIVE OVERBITE

Another most interesting malocclusion was found in a dachshund; his jaws were in neutroclusion; his mandibular incisors and canines were in linguoversion and were biting on the palate, thereby showing that well-known condition of an *excessive overbite;* also in this dog some teeth were congenitally absent.

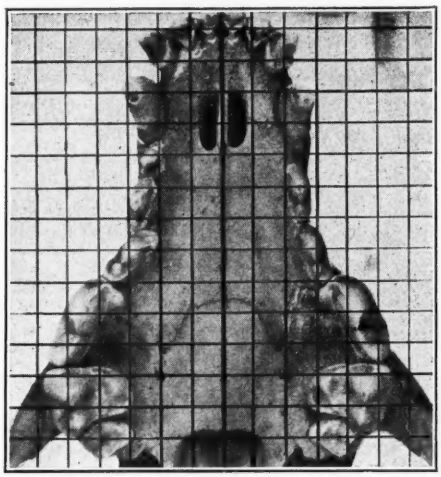

Fig. 3.—Maxillary arch of fox terrier. The left first premolar is congenitally missing; the second premolar has drifted mesially, the canine distally, the left third premolar is in torsiversion.

BASTARDIZATION

The effect of bastardization is shown in two dogs which did not belong to the same litter and which were examined independently; they possessed some of the characteristics of the boxers, but evidently mixed with some characteristics of other species. Both these dogs showed similar conditions: their incisors did not occlude in the reverse overbite typical for the pure boxers, nor did they assume the normal overbite common with other dogs. They met in an in-between position, namely, an edge-to-edge bite (Fig. 4).

The most interesting information contained in Ritter's article is probably the fact that a definite malocclusion is, we may say, "normally" found in certain species of dog. This may, therefore, be considered as a truly "inherited" malocclusion, but we also must realize that the species referred to presents other very distinctly inherited characteristics which are not found in other dogs. The problem of heredity as a factor in the etiology of malocclusion has intrigued the orthodontic profession for many years. Obviously, this question is most difficult to study in human beings where one investigator can gather data of only

two or three generations at best. Observation and experimentation on short-lived animals, however, present a method better suited for this purpose and one which has already helped to solve other problems of heredity. We also notice in dogs a number of other conditions with which we are only too familiar from observations on our human patients. There belong: the typical incident of drifting of adjoining teeth into spaces due to missing or extracted teeth; also torsiversions of teeth under these conditions; the excessive overbite, which of late has

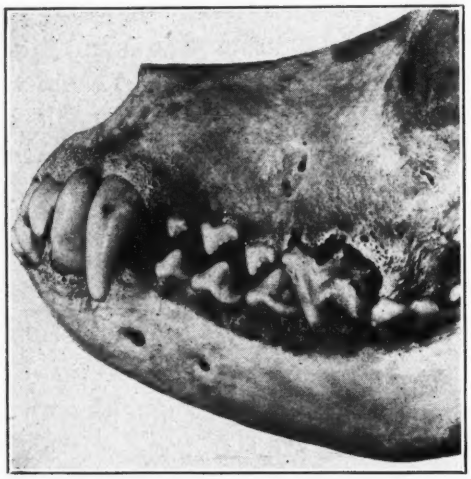

Fig. 4.—Occlusion of bastard with boxer; neutroclusion with edge-to-edge bite of incisors.

become of great interest to us as a consideration of periodontal disturbances. It is remarkable to see how frequent is the occurrence of congenitally missing teeth in dogs; a comparison with the dentition of the wild species of the dog family (wolf) might be interesting in order to determine whether domestication and lack of sufficient exercise played a rôle in nature's elimination of certain teeth.

CORRESPONDENCE

To the Editor,
THE INTERNATIONAL JOURNAL OF ORTHODONTIA
AND DENTISTRY FOR CHILDREN.

Dear Sir:

I shall be very grateful for the assistance of any one who has observed the effects produced by misplaced, buried, and impacted teeth, in helping me gather material for an article to be written on this subject in collaboration with L. Monier, M.D., D.S., Paris, France.

I shall appreciate very much any information sent to me bearing on the points listed below and for any reprints, clippings or references to articles or books bearing on the subject.

A. At what age and how was the tooth or teeth discovered?
B. At what age was the tooth or teeth removed?
C. Has malignancy been observed to precede or follow the removal of or failure to remove the same?
D. What signs, symptoms or effects, local, general or special, drew attention to such a tooth or teeth or accompanied the presence of the same?
E. What method was employed to remove the tooth or teeth?
F. What anesthetic was used?
G. What result, if any, did the removal have on the previously mentioned signs, symptoms, or effects?
H. Did the removal have any other effects than those previously mentioned?
I. The sex of the patient.
J. The race of the patient.
K. The *position* of the tooth or teeth. Any prints of x-ray films or plates, or any diagrams or drawings showing the position and relation to other teeth or other structures will be valuable and will be appreciated.

Any x-ray films, diagrams or drawings that are sent to me will be returned if requested and credit will be given for any material used (please write name and address plainly).

Sincerely yours,

(Signed) ALONZO MILTON NODINE, D.D.S. (N. Y. Univ.),
L.D.S., R.C.S. (Eng.), L.R.C.P. (Lond.), M.R.C.S. (Eng.)
117, The Ridgway, Wimbledon,
London, S.W. 19, England.

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EDITORIALS

The 1933 Meeting of the American Society of Orthodontists at Oklahoma City

OKLAHOMA CITY, from November 8 to 10, 1933, was host to the American Society of Orthodontists, and also to the Oklahoma State Dental Society, the meetings of the two organizations being held at the same time. The headquarters of the American Society of Orthodontists was the new Oklahoma Biltmore Hotel, the headquarters for the Oklahoma State Dental Society being the Skirvin Hotel.

The 1933 meeting of the American Society of Orthodontists, in spite of its being circumscribed with many unforeseen obstacles, was a great success in every way. When it was necessary to postpone the meeting scheduled for April because of the general bank moratorium, there was some sentiment for cancellation of the dues and the 1933 meeting entirely. Others favored having the meeting in Chicago in connection with the national convention of the American Dental Association and the Century of Progress. Those directing the activities of the organization held fast to their opinion that the Southwest should hold the meeting, and that the interests of the organization could best be served by holding the meeting during November in Oklahoma City. The president and his coworkers fortunately had their convictions confirmed, for about two hundred and fifty, including essayists, clinicians and exhibitors, attended the meeting and proclaimed it one of the most interesting conventions ever held by the American Society of Orthodontists.

Everywhere were manifest enthusiasm, loyalty and effort in supporting the meeting by the whole southwestern group. Innovations and unprecedented ideas were placed in effect. Two golf tournaments were in progress at the same time, one for the State Dental Association and one for the American Society of Orthodontists, and in a similar arrangement the evening stag parties were held as preliminaries to the business and scientific programs of each organization. The golf tournament of the Oklahoma State Dental Society was directed by Dr. A. L. Jones of Edmond, who presided at the banquet. A stag banquet of the American Society of Orthodontists was presided over by the director of the golf tournament, Dr. E. F. Woodring, until later in the evening when the ceremonies of the stag affair were taken over by Dr. Frank Casto of Cleveland, Ohio, president of the American Dental Association, who then directed the party into a spirit of fun and revelry. Dr. Oscar Busby of Dallas graciously lent himself to the occasion by submitting as candidate for initiation into the ostensibly secret orders of the day.

Dr. Brusse of Denver was awarded first prize and Dr. James J. Guerrero of Chicago was awarded second prize for low net scores among the orthodontists in the handicap tournament of the dental society. Dr. Frank Casto of Cleveland, Dr. E. B. Arnold of Houston, and Dr. Curtis Williams of Shreveport, won first, second, and third prizes, respectively, in the handicap tournament held by the American Society of Orthodontists. Dr. E. F. Woodring of Tulsa won the C. V. Mosby championship cup of the Southwestern Society for low medalist. Dr. W. T. Chapman of El Paso was the runner-up.

The gala night was the joint dinner dance in the spacious and beautifully decorated clubhouse of the Oklahoma City Golf and Country Club. It really was a surprise party for the visiting orthodontists, as a large group of Oklahoma City's charming young ladies joined the party to become their dinner partners. The theme song, "The Last Round-Up," was typical of the scheme used in rounding up some four hundred dentists, orthodontists, and their wives for a most enjoyable evening. Many parties were held before and after the banquet and dance by various members in Oklahoma City.

With Dr. T. W. Sorrels of Oklahoma City acting as master of ceremonies and Dr. Leuman Waugh of New York City serving as toastmaster, the program of the evening was put over in grand style. Dr. Arthur C. Seids, as president of the state dental society, delivered a toast of welcome, and Dr. W. E. Flesher, as president of the American Society of Orthodontists, responded with an appropriate greeting. Mr. Josh Lee, Dean of Public Speaking of Oklahoma University, gave a rousing address.

The hope of the committee on arrangements that many members might be induced to bring their wives to Oklahoma City and the Southwest on a sightseeing and vacation trip was fully rewarded. Almost one-fourth of those who attended the meeting brought their wives.

An informal reception was held for the ladies while the men attended the golfers' banquet. A bridge luncheon was given by the ladies' auxiliary of the local dental society in the Venetian room of the Skirvin Hotel in honor of the visiting ladies. Those receiving favors for high scores among the wives of orthodontists were Mrs. G. L. Corley of Mattoon, Ill., and Mrs. Winston Cain of Chattanooga, Tenn. A sight-seeing tour and a luncheon of one of the country clubs made up the balance of the program for the ladies.

The commercial exhibits were large and interesting. Several scientific exhibits which attracted a great deal of attention were shown by medical specialists of national reputation:

"Electrogalvanic Phenomena in the Oral Cavity Caused by Dissimilar Metals." Dr. E. S. Lain, Oklahoma City.

"Allergic Diseases." Dr. Ray N. Balyeat and Dr. Ralph Bowen, Oklahoma City.

"Exhibit of Endocrinopathies." Dr. Henry H. Turner, Oklahoma City.

"Plastic Surgery of Mouth and Face." Dr. Curt Von Wedel, Oklahoma City.

The public program was another outstanding feature, with more innovations. Pictures of officers, clinicians and lecturers were assembled in advance. Briefs on lectures were gathered and assembled in advance, and all publicity was released through a paid publicity agency. Forty articles of a dignified and educational type appeared in local papers, and much of it was released to the Associated Press. The experiment demonstrated conclusively that this is by far the most practical method for handling this heretofore troublesome and embarrassing problem. The Oklahoma Publishing Company was more than liberal with space and the number of pictures it published without expense to the Society.

Five lecturers discussed the public relations of dentistry, with an explanation of the science of orthodontia, before five civic clubs during the week.

Oklahoma City has one of the largest and most active chamber of commerce organizations in the country. Their Friday weekly forum luncheon was dedicated to dentistry. It happened to be on the last day of the convention, and the dining room was filled to capacity and many were turned away. Dr. Frank A. Delabarre was the able speaker of the day for the orthodontia and dental societies, and his lecture was broadcast over Radio Station WKY.

Four other radio addresses were delivered on orthodontia and dentistry in general. This educational service was thoroughly appreciated by the public, and it is the duty of organized dentistry to give the laity the educational advantages of its meetings.

Comment on Program of the Meeting of the American Society of Orthodontists Held in Oklahoma City

ON TUESDAY morning, November 8, there was a good attendance to open the annual meeting of the American Society of Orthodontists.

The Hon. J. F. Owens, president of the Oklahoma City Chamber of Commerce and director of the United States Chamber of Commerce, in extending a welcome gave a comprehensive address on education and called attention to the splendid achievements of orthodontia for both the individual and the public.

Drs. Spencer, Robison and Bach, members of the Program Committee, planned a very profitable program, interesting as to diagnosis and treatment, and with subjects on correlated branches of orthodontia. The program was well balanced, and there was ample material to occupy one's thoughts for some time.

An unusual group of papers was presented on Wednesday afternoon. At this session the members of the Oklahoma State Dental Society, who were holding their annual meeting at another hotel, attended as guests of the American Society of Orthodontists.

"Observations on the Dental Development of Children Showing Various Endocrine Disturbances" by Carlton J. Marinus, M.D.

"Allergic Rhinitis in Children" by Ray M. Balyeat, M.D., and Ralph Bowen, M.D.

"Phosphorus Deficiency in Soil and Plant Life" by Horace J. Harper.

The two papers last named, together with a paper by J. B. McKnight, were newly presented subjects.

Dr. R. C. Willett's paper was of an unusual character and was presented in a unique manner. The normal diet was discussed; then the case with an unusual infant diet was presented in which every phase of the diet was quite contrary to what is usually necessary for proper growth and dentition. This paper suggested a closer study in diagnosis and called attention to the far-reaching effects of nutrition.

Other papers of great interest were presented:

"The Growth of the Teeth in Relation to the Face" by Dr. Herbert I. Margolis, Boston.

"The Treatment of Dental Deformities" by Dr. B. E. Lischer, St. Louis.

"Diagnosis of Mesioclusion" by Dr. Frank A. Delabarre, Boston.

"Twin Wire Appliances" by Dr. J. E. Johnson, Louisville, Ky.

There was also included in the program a series of excellent case reports given by Drs. Glenn F. Young, Hugh G. Tanzey, and Wm. H. Humphrey.

Dr. Paul G. Spencer is to be commended for the excellent papers given at the meeting, after his untiring efforts to round out the program. The case reports secured by Dr. Homer B. Robison were equal in substance to most papers. They were well prepared and presented, and helped to make this one of the most interesting programs presented before the Society.

The clinics were presented Thursday night—an innovation which proved a success. There was no hurry; one could stay as long as one desired.

The clinics were of a very high standard. Dr. Ernest N. Bach, clinic chairman, worked diligently in getting the clinics together; they were of a very practical nature and aroused much interest among the members and guests.

Of especial interest were the clinics and demonstration on the use of chrome alloy, interest being stimulated by the increase in cost of the usual orthodontic precious metal materials and the apparent success some members are having with the use of chrome alloy.

In the president's address, group study was urged, especially now when more time for study is available for improving technic and theory. The president also mentioned the study of dentistry in its relation to public health. He pointed out the serious effect of the extensive neglect of the teeth during the past three or four years.

Attention was also called to the interrelation of the sectional societies to the American Society of Orthodontists and the need of all sectional orthodontic societies being organized as component parts of the American Society of Orthodontists. Accordingly at a business session a resolution was passed authorizing the incoming president, Dr. L. M. Waugh, to appoint a committee to formulate plans for organizing the sectional societies as part of the American Society of Orthodontists. It was thought this move would be a step forward in promoting and coordinating the advancement of orthodontia. It was pointed out that this move would mean a saving in the total dues paid to societies by the members.

The next meeting of the Society will be held in New York City in April, 1935; and since there will be no meeting in 1934, the dues were remitted.

Judging from the number of new applications for membership, one would think the times were normal; there were more than the usual number of applications.

This was the first meeting held after the adoption of the new Constitution and By-Laws, and every phase of the meeting operated in an excellent manner. All committees except one functioned and gave excellent reports.

The following officers were elected:

L. M. Waugh, President
H. C. Pollock, President-Elect
J. D. McCoy, Vice-President
Claude R. Wood, Secretary-Treasurer

A Contribution to the Study of Heredity

OF VITAL interest to those engaged in the fields of medicine and education, was the recent announcement that the Nobel Prize for physiology and medicine in 1933 had been awarded to Dr. Thomas Hunt Morgan, Professor of Biology at the California Institute of Technology. This recognition is accounted the highest award of the year for scientific achievement, and in this instance is a fitting recognition of the work of a man who has made one of the truly great contributions in the field of medicine. In its importance and significance, it is comparable with the discovery of the circulation of the blood by Harvey, and the germ theory of disease by Pasteur.

For the past thirty years, Dr. Morgan has carried out an intensive research directed toward the secrets of heredity, seeking to learn the mechanism by which characteristic traits are passed from parent to offspring. Through his personal efforts and the researches he directed, a considerable part of his quest was achieved, he demonstrating the presence of so-called "genes," these being the ultramicroscopic particles that carry inheritance from generation to generation. In 1926, he published a book entitled *The Theory of the Genie,* setting forth his researches and giving to the world the evidence upon which his conclusions had been established.

It is rather interesting to note that but five years elapsed after the publication of his researches before they were given recognition. All scientists have not enjoyed such a prompt reaction to their efforts, and in some cases they have died without the knowledge or satisfaction of public appreciation. In this connection might be sighted the experience of Gregor Johann Mendel, an Augustinian monk who lived in the small Austrian village of Brunn, and who, some time between the years of 1860 and 1865, conducted a series of experiments in the garden of his monastery which were later to have a profound effect in the very field in which Dr. Morgan has gained recognition. Utilizing different varieties of garden peas *(Pisum sativum),* in which he found well-marked contrasting characters, he crossed and recrossed these, producing a large number of generations and noted the effect upon inheritance of these blended or combined characters. He extended these experiments in other fields, and finally presented his material before the Natural History Society of Brunn in 1865, through whose auspices it was published under the title *Experiments in Plant-Hybridization.* Although through his experiments there were established some fundamental laws of heredity, now known as the Mendelian Laws, this humble scholar never lived to see his work given recognition. It was not until after 1900 that other biologists, conducting similar experiments, came to identical conclusions, and in the course of time Mendel's work was uncovered and he was accorded the credit due him. It is refreshing to note that among those most generous to Mendel and his achievements is Dr. Morgan. In fact, he has often proclaimed himself the Apostle Paul of Mendelism.

The Nobel Prize, under which Dr. Morgan receives his award, was founded in 1896 by the Swedish scientist, Alfred B. Nobel, who was the inventor of dynamite. Having an appreciation of what achievement in various lines meant to civilization, he set aside a fund sufficiently ample so that each year an award is made. In 1933 and in previous years, it amounted to approximately $40,000.

—J. D. Mc.

NEWS AND NOTES

Southern Society of Orthodontists

The thirteenth annual meeting of the Southern Society of Orthodontists will be held at The Homestead, Hot Springs, Virginia, July 16, 17 and 18.

A cordial invitation is extended to all ethical members of the dental and medical professions.

N. F. MUIR, President,
Shenandoah Life Bldg.,
Roanoke, Va.
WILLIAM P. WOOD, JR., Secretary,
442 W. Lafayette Street,
Tampa, Fla.

Kansas, Missouri and Oklahoma Tri-State Meeting

The state dental associations of Kansas, Missouri and Oklahoma will hold their annual meetings jointly at the Ararat Temple, Kansas City, Mo., May 6, 7, 8 and 9. An excellent program has been arranged, and all members of the American Dental Association are cordially invited to attend.

FRED A. RICHMOND,
305 Federal Reserve Bldg.,
Kansas City, Mo.

Chicago Dental Society

The Chicago Dental Society will hold its seventieth annual midwinter meeting February 26 to March 1, inclusive, at the Stevens Hotel, Chicago.

Thomas P. Hinman Midwinter Clinic

The annual meeting of the Thomas P. Hinman Midwinter Clinic will be held Monday and Tuesday, March 12 and 13, 1934, at the Biltmore Hotel, Atlanta, Ga.

JOS. D. OSBORNE, Secretary,
604 Doctors' Building,
Atlanta, Ga.

Committees of the American Society of Orthodontists

COMMITTEES—ELECTIVE

Board of Censors	*Chairman*, W. A. Murray	1936	Evanston, Ill.
	H. L. Hosmer,	1935	Detroit, Mich.
	C. B. Mott,	1934	Asheville, N. C.
Budget	*Chairman*, W. E. Ellis,	1936	Buffalo, N. Y.
	Ernest Bach,	1935	Toledo, Ohio
	O. W. White,	1934	Detroit, Mich.

Constitution and By-Laws	*Chairman,* F. M. Casto,	1936	Cleveland, Ohio
	C. C. Howard,	1935	Atlanta, Ga.
	Oren A. Oliver,	1934	Nashville, Tenn.
Education	*Chairman,* Earl G. Jones,	1936	Columbus, Ohio
	F. T. Murlless, Jr.,	1935	Hartford, Conn.
	B. E. Lischer,	1934	St. Louis, Mo.
Publication	*Chairman,* G. Vernon Fisk,	1936	Toronto, Canada
	O. W. Brandhorst,	1935	St. Louis, Mo.
	W. A. Murray,	1934	Evanston, Ill.
Legislation	*Chairman,* L. J. Porter,	1936	New York
	A. E. Scott,	1935	San Francisco, Calif.
	C. C. Howard,	1934	Atlanta, Ga.
Research	*Chairman,* Milo Hellman,	1935	New York
	A. H. Ketcham,	1934	Denver, Colo.
	G. R. Moore,	1936	Ann Arbor, Mich.
Relief	*Chairman,* G. M. Anderson,	1936	Baltimore, Md.
	H. A. Stryker,	1935	Santa Ana, Calif.
	J. A. Burrill,	1934	Chicago, Ill.

COMMITTEES—APPOINTIVE

*Program**	*Chairman,* J. D. Eby,		New York
	H. U. Barber, Jr.		New York
	L. J. Porter,		New York
Nomenclature†	*Chairman,* F. A. Delabarre,	1934	Boston, Mass.
	B. W. Weinberger,	1935	New York
	B. E. Lischer,	1936	St. Louis, Mo.
Necrology†	*Chairman,* H. C. Ferris,	1935	New York
	B. Frank Gray,	1934	San Francisco, Calif.
	H. E. Hoffman,	1936	Denver, Colo.
*Local Arrangements**	*Chairman,* G. S. Callaway,		New York
	Glenn F. Young,		New York
	Sidney E. Riesner,		New York
Inter-Relations‡	*Chairman,* J. D. Eby,	1938	New York
	W. W. Woodbury,	1937	Halifax, Canada
	Wm. E. Flesher,	1936	Oklahoma City, Okla.
	John V. Mershon,	1935	Philadelphia, Pa.
	Lloyd S. Lourie,	1934	Chicago, Ill.
*Public Relations Committee**	*Chairman,* R. C. Willett,		Peoria, Ill.
	F. A. Delabarre,		Boston, Mass.
	C. S. Baker,		Evanston, Ill.

LOCAL COMMITTEES*

General Arrangements	*Chairman,* H. U. Barber, Jr., New York City
	C. Sterling Conover, New York
	Stanley M. Dow, New York
	Herbert E. Ernst, New York
	Donald Hutchinson, New York
	Milton S. Tucker, Flushing, N. Y.

*Appointed by the president for one year.
†Appointed by the president, one member for three years.
‡Appointed by the president, one member for five years.

Scientific Exhibits	*Chairman,* Chas. A. Spahn, New York
	Harvey G. Bean, Toronto 5, Canada
	Fred R. Blumenthal, Boston, Mass.
	O. W. Brandhorst, St. Louis, Mo.
	James W. Ford, Chicago, Ill.
	Burton A. Hoffman, Buffalo, N. Y.
	Edward G. Murphy, New York
	Frank Nicolai, Brooklyn, N. Y.
	Allen H. Suggett, San Francisco, Calif.
Registration	*Chairman,* Franklin A. Squires, White Plains, N. Y.
	E. Santley Butler, New York
	Walter C. Chapin, New York
	Glenn H. Whitson, Brooklyn, N. Y.
	Claude R. Wood, Knoxville, Tenn.
Reception	*Chairman,* Frank E. Rians, Englewood, N. J.
	Albert W. Crosby, New Haven, Conn.
	Julius Goldberg, New York
	Milo Hellman, New York
	Norman L. Hillyer, Brooklyn, N. Y.
	E. Percy Hollingshead, New York
	Richard Lowy, Newark, N. J.
	John W. Ross, Philadelphia, Pa.
	William J. Speers, Boston, Mass.
	Ransford B. Van Gieson, Newark, N. J.
	Raymond L. Webster, Providence, R. I.
Banquet	*Chairman,* William C. Keller, New York
	Alfred M. Denoes, Brooklyn, N. Y.
	Augustus B. Holt, New York
	Eugene J. Kelly, Newark, N. J.
	S. L. Kregarman, New York
Golf	*Chairman,* Ashley E. Howes, New Rochelle, N. Y.
	James C. Allan, New York
	Percy R. Ashplant, Newbergh, N. Y.
Ladies Committee	*Chairman,* Oscar Carrabine, New York
*Advisory to the President**	F. M. Casto, Cleveland, Ohio
	W. H. Ellis, Buffalo, N. Y.
	Harry E. Kelsey, Baltimore, Md.
	Frederick C. Kemple, New York
	Lloyd S. Lourie, Chicago, Ill.
	James D. McCoy, Los Angeles, Calif.
	John V. Mershon, Philadelphia, Pa.
	F. T. Murlless, Jr., Hartford, Conn.
	Herbert A. Pullen, Buffalo, N. Y.
	Alfred P. Rogers, Boston, Mass.
	Ralph Waldron, Newark, N. J.

Notes of Interest

Dr. E. T. Tanner announces that his dental practice, beginning with January 1, 1934, will be limited to orthodontia and children's dentistry. Offices in the Trust Building, Jefferson City, Mo.

Dr. Henry Hicks announces that he has associated with him Dr. Clare K. Madden, who will confine his work to preventive dentistry for children from three to fourteen years of age. Offices located at 5 Glen Court, Greenwich, Conn.

*Appointed by the president for one year.

Dr. Florence Rich formerly with the Children's Municipal Dental Clinics announces the opening of offices in the Smith Building, St. Louis, Mo., for the practice of children's dentistry.

Dr. Adelbert Fernald of Boston has opened a branch office in Andover, near Phillips Academy, where he practices orthodontia exclusively.

Dr. Brooks Bell announces the removal of his office on January 1, to 3526 Cedar Springs Road, at Hood Street, Dallas, Texas. Practice limited to orthodontia.

Dr. Harry A. Allshouse, orthodontist of Kansas City, Mo., captured the city's all-around trapshooting championship for the season of 1933.

Dr. George L. Turner, formerly of Wichita, Kansas, announces opening of offices at 3780 Wilshire Boulevard, Los Angeles. Practice limited to orthodontia.

Dr. Jerome H. Trier announces the removal of his offices to 993 Park Avenue, New York City.

Dr. Marcu Brucker has moved his offices from Jersey City to 666 Sandford Avenue, Newark, N. J.